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AERONAUTICS

Includes aeronautics (general); aerodynamics; air transportation and safety; aircraft communications and navigation; aircraft design, testing and performance; aircraft instrumentation; aircraft propulsion and power; aircraft stability and control; and research and support facilities (air).

For related information see also *Astronautics*.

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For related information see also *34 Fluid Mechanics and Heat Transfer*.

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For related information see also *34 Fluid Mechanics and Heat Transfer*.

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Includes passenger and cargo air transport operations; and aircraft accidents.

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Includes aircraft simulation technology.

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Includes cockpit and cabin display devices; and flight instruments.

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07 AIRCRAFT PROPULSION AND POWER 2758

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and on-board auxiliary power plants for aircraft.

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Includes astronautics (general); astrodynamics; ground support systems and facilities (space); launch vehicles and space vehicles; space transportation; spacecraft communications, command and tracking; spacecraft design, testing and performance; spacecraft instrumentation; and spacecraft propulsion and power.

For related information see also *Aeronautics*.

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18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE N.A.

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20 SPACECRAFT PROPULSION AND POWER 2766

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For related information see also *07 Aircraft Propulsion and Power, 28 Propellants and Fuels,* and *44 Energy Production and Conversion*.

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Includes rocket propellants, igniters, and oxidizers; storage and handling; and aircraft fuels.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power,* and *44 Energy Production and Conversion*.

ENGINEERING

Includes engineering (general); communications; electronics and electrical engineering; fluid mechanics and heat transfer; instrumentation and photography; lasers and masers; mechanical engineering; quality assurance and reliability; and structural mechanics.

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83 ECONOMICS AND COST ANALYSIS 2877
Includes cost effectiveness studies.

84 LAW AND POLITICAL SCIENCE 2877
Includes space law; international law; international cooperation; and patent policy.

85 URBAN TECHNOLOGY AND TRANSPORTATION 2878
Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.
For related information see *03 Air Transportation and Safety, 16 Space Transportation,* and *44 Energy Production and Conversion.*

SPACE SCIENCES

Includes space sciences (general); astronomy; astrophysics; lunar and planetary exploration; solar physics; and space radiation.
For related information see also *Geosciences.*

88 SPACE SCIENCES (GENERAL) 2880

89 ASTRONOMY 2880
Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

90 ASTROPHYSICS 2881
Includes cosmology; and interstellar and interplanetary gases and dust.

91 LUNAR AND PLANETARY EXPLORATION 2881
Includes planetology; and manned and unmanned flights.
For spacecraft design see *18 Spacecraft Design, Testing and Performance.* For space stations see *15 Launch Vehicles and Space Vehicles.*

92 SOLAR PHYSICS 2882
Includes solar activity, solar flares, solar radiation and sunspots.

93 SPACE RADIATION 2883
Includes cosmic radiation; and inner and outer earth's radiation belts.
For biological effects of radiation see *52 Aerospace Medicine.* For theory see *73 Nuclear and High-Energy Physics.*

GENERAL

99 GENERAL N.A.

Note: N.A. means that no abstracts were assigned to this category for this issue.

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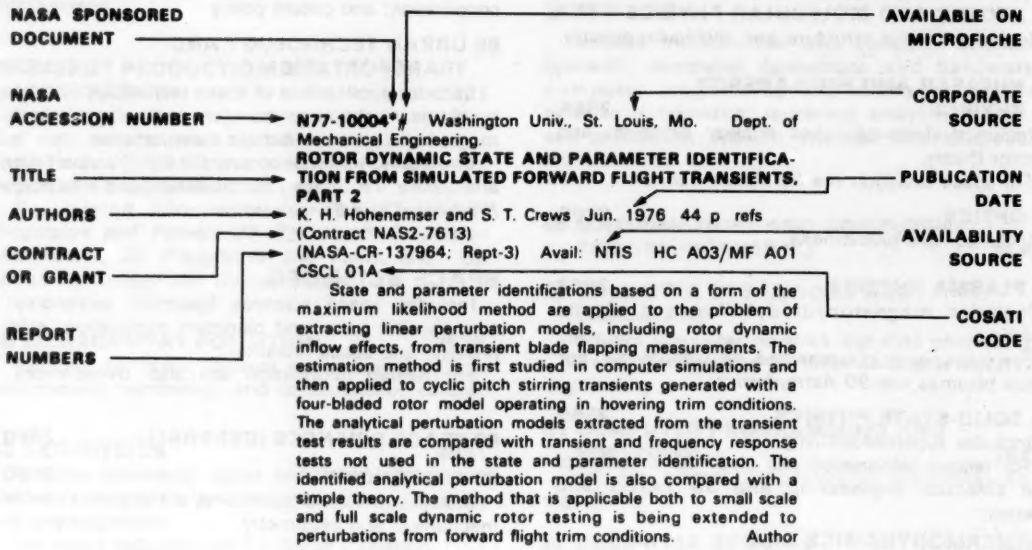
TYPICAL CITATION AND ABSTRACT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N77-10004*# Washington Univ., St. Louis, Mo. Dept. of Mechanical Engineering.
TITLE
ROTOR DYNAMIC STATE AND PARAMETER IDENTIFICATION FROM SIMULATED FORWARD FLIGHT TRANSIENTS, PART 2
PUBLICATION DATE
AUTHORS
K. H. Hohenemser and S. T. Crews Jun. 1976 44 p refs
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COSATI CODE
State and parameter identifications based on a form of the maximum likelihood method are applied to the problem of extracting linear perturbation models, including rotor dynamic inflow effects, from transient blade flapping measurements. The estimation method is first studied in computer simulations and then applied to cyclic pitch stirring transients generated with a four-bladed rotor model operating in hovering trim conditions. The analytical perturbation models extracted from the transient test results are compared with transient and frequency response tests not used in the state and parameter identification. The identified analytical perturbation model is also compared with a simple theory. The method that is applicable both to small scale and full scale dynamic rotor testing is being extended to perturbations from forward flight trim conditions. Author

ON-GOING RESEARCH PROJECTS

This is a listing of research projects – not publications

AERONAUTICS

Includes Aeronautics (general); Aerodynamics; Air Transportation and Safety; Aircraft Communications and Navigation; Aircraft Design, Testing, and Performance; Aircraft Instrumentation; Aircraft Propulsion and Power; Aircraft Stability and Control; and Research and Support Facilities (air). For Related Information See Also Astronautics.

1.0001, DEVELOPMENT OF CAST CARCASS TIRES FOR MILITARY AIRCRAFT
E.J. GEORGIA, Zedron Incorporated, *Baltimore, Maryland* (DF132480; F33615-76-C-3062)

Military aircraft tires are presently fabricated from a multiplicity of components assembled by essentially a manual operation which results in high tire cost. The objective of this work unit is to develop a castable replaceable tread aircraft tire from thermosetting polymers which can be fabricated with a minimum of manual labor and will result in a significant reduction of military aircraft tire cost.

This effort consists of two parts: development of a completely cast, one-piece aircraft tire and development of a two-piece cast carcass/replaceable tread aircraft tire. The effort may be awarded to single or dual contractor(s). The prototype tires developed in this effort will be 7.00-8/16 PR type III size. This size tire is used on the A-37 aircraft. The one-piece tire and the carcass of the two-piece tire will be cast or molded from high strength elastomers in machinery common to the plastics industry. The replaceable belt of the two-piece tire will be fabricated from conventional rubber compounds with reinforcing cords. The entire effort will be broken into three phases: materials evaluation, multiple iterations of prototype tire designs, and design refinement of the most promising prototype concept. This last phase will also consist of a plan for fabrication of tires suitable for flight test.

ADDENDA: Supporting agency address is: AF Flight Dynamics Laboratory FEM, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense, Air Force

1.0002, MANUAL ENTRY AND DISPLAY (MED) FOR CLARKSBURG
J.D. NILSEN, U.S. Dept. of Commerce, Equipment Development Lab., *Silver Spring, Maryland* 20910 (RAA231)

TECHNICAL OBJECTIVE: To develop a manual entry and display (MED) with an additional display to be operated remotely in the sunlit environment of a tower. Interface the system with the AMOS III-70 presently installed at the Clarksburg, West Virginia tower.

APPROACH: Expand AMOS MED to provide additional required functions including designing new circuitry to interface the bright display and the printer.

PROGRESS (SEPTEMBER 1976 - OCTOBER 1976): This is a new reimbursably funded project for FAA started in September 1976. The basic MED has been fabricated. Design of the remote display is underway.

SUPPORTED BY U.S. Dept. of Transportation, Federal Aviation Admin., Systems Research & Development Service

1.0003, HORIZONTAL NAVIGATION TACTICAL DISPLAY
G.T. BURTON, Radio Corporation of America, *Burlington, Massachusetts* 01803 (DN581340; N62269-75-C-0186)

To determine the optimum design characteristics for a horizontal navigation tactical display for a 1980 era aircraft. The horizontal display is intended to provide the pilot navigational information on a full-color map display. The horizontal display will also present stored imagery and dynamic symbology. This contract supports work unit DK210, agency accession no. DN 233231.

To conduct the exploratory development of laster holographic techniques and material for a pilot's horizontal display system.

ADDENDA: Supporting agency address is: Naval Air Development Center, Sys. Analysis and Eng Dept, Warminster, PA

SUPPORTED BY U.S. Dept. of Defense, Navy

1.0004, UNSTEADY TURBULENT BOUNDARY LAYER BY WIND TUNNEL EXPERIMENTS
E. COVERT, Mass. Inst. of Technology, School of Engineering, *Cambridge, Massachusetts* 02139 (DF047010; F49620-77-C-0031)

AF function - advanced aerospace vehicles. Opportunity - gain further understanding of unsteady boundary layers. Objective -investigate the unsteady boundary layer phenomena induced on a fixed, stationary, two-dimensional airfoil. How work contributes - better knowledge of the unsteady mechanisms of a turbulent boundary layer will contribute understanding of flutter, buffeting and stall flutter, all common problems for air foils used for helicopter blades, rotating machinery blades and fixed wing aircraft lifting surfaces. The data obtained from this effort will be directly applicable to the design of future aerospace vehicles.

An experimental program will be established with the following goals: 1) establish a boundary layer on a well-documented airfoil in steady primary flow and provide an unsteady local outer flow, 2) take quasi-steady pressure coefficient and boundary layer parameter measurements for comparison with the unsteady flow data to select the test geometries required to produce the unsteady local flows, 3) select the optimum configurations and take experimental measurements of the turbulent boundary layer properties such as velocity profiles, fluctuation pressure and local skin friction.

ADDENDA: Supporting agency address is: AF Office of Scientific Research NA, Bldg 410, Bolling AFB, DC 20332

SUPPORTED BY U.S. Dept. of Defense, Air Force

1.0005, ANALYTICAL EVALUATION OF TWO MOTION WASHOUT TECHNIQUES
L.R. YOUNG, Mass. Inst. of Technology, School of Engineering, *Cambridge, Massachusetts* 02139 (NSG 1416)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Organization & Management Office, Office of University Affairs

1.0006, VISUAL VESTIBULAR INTERACTION AND ITS APPLICATION TO FLIGHT SIMULATION
L.R. YOUNG, Mass. Inst. of Technology, School of Engineering, *Cambridge, Massachusetts* 02139 (NSG 2230)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Organization & Management Office, Office of University Affairs

1.0007, STUDY OF THE DESIGN AND PERFORMANCE CHARACTERISTICS OF AIRCRAFT SIMULATORS
L.E. FOGARTY, Univ. of Michigan, School of Engineering, *Ann Arbor, Michigan* 48106 (DF047810; AF-AFOSR-3245-77)

AF function - specific means for improving simulation technology, taking into account problems of motion, visual and flight simulation, are needed to help optimize present and future Air Force simulation assets. Deficiency - specific recommendations for optimizing Air Force simulation performance characteristics are still lacking. Objective -current state-of-the-art motion system performance capabilities will be analyzed and specific recommendations will be concerning the relative improvements to be anticipated through additional engineering development efforts. How research contributes - greater training and cost effectiveness of Air Force simulators, including the ASUPT, through a systematic, in-depth and on-site review of current and planned simulation assets.

A result of 20 months of on-site in-depth study of the available and applicable technology, specific engineering development efforts to improve Air Force simulation assets will be made.

ADDENDA: Supporting agency address is: AF Office of Scientific Research XO, Bldg 410, Bolling AFB, DC 20332

SUPPORTED BY U.S. Dept. of Defense, Air Force

1.0008, VISUAL LANDING AIDS (VLA) SIMULATION
M. KOLODNER, U.S. Navy, Air Engineering Center, *Lakehurst, New Jersey* 08733 (DN796000)

To be able to simulate all platforms/planes, VLA configurations, and make recommendations on improvements of existing and new configurations.

There are several government facilities as well as private industry that have highly sophisticated simulation facilities and with slight modification can add the testing of the VLA equipment for all types of platforms and planes.

ADDENDA: Supporting agency address is: Naval Air Systems Command, Washington, D C 20361

SUPPORTED BY U.S. Dept. of Defense, Navy

1.0009, ADVANCED TURBINE MATERIALS DEMONSTRATION
A.L. SHEXSCHNEIDER, General Electric Company, *Cincinnati, Ohio* 45215 (DF459660; F33615-76-C-2150)

Demonstrate the capability of a Si/SiC ceramic turbine shroud to perform satisfactorily in an operational engine.

Design shroud supports and shroud materials to be tested in a CF-6 or an LM 2500.

ADDENDA: Supporting agency address is: AF Aero-propulsion Laboratory TBC, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense, Air Force

1.0010, CRF/J85 TRANSIENT INVESTIGATION
F. OSTDIEK, U.S. Air Force, Aero Propulsion Lab., *Dayton, Ohio* 45433 (DF460550)

The primary objectives of this program are to determine the effects of speed transients on compressor performance, to obtain detailed information on compressor operating paths during transient operation, and to investigate the cause of compressor performance differences between transient and steady-state operation. This information will primarily be used to evaluate transient compressor test techniques for application to APL's CRF.

A J85-5 engine will be instrumented for transient compressor testing, the instrumentation will be interfaced with a MOD COMP II computer system for storage and processing of test data. An analysis of the data will be made in order to relate specific aerodynamic parameters to changes in performance that result during transient operation that can lead to compressor stall.

ADDENDA: Supporting agency address is: AF Aero-propulsion Laboratory DO, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense, Air Force

1.0011, SURVIVABLE AIRCRAFT TRANSPARENT ENCLOSURES
E.O. ROBERTS, U.S. Air Force, Flight Dynamics Lab., *Dayton, Ohio* 45433 (DF140230)

The work unit supports the development of fighter aircraft to survive the anticipated operational environment including hostile threats for laser weapons, nuclear EMP and thermal shock, fragments from high-energy missile warheads and conventional small arms fire and the natural induced environment of high temperatures. Detailed aircraft specifications, design requirements, design criteria and even general guidelines do not currently exist for aircraft transparencies. The objective of this effort is to define the design requirements for a near-term aircraft transparency system. Current development activity exists for the re-design and retrofit of various USAF aircraft transparency systems to survive their respective environments. Early analysis and study to develop preliminary development guidelines will result in a considerable savings not only in acquisition costs but also logistic support costs. This early activity will also establish the operational performance parameters that effect the design of transparencies so that preliminary analyses and trade studies can be performed more effectively.

The approach is to review existing air-to-surface (ATS) and other documentation to determine the near-term fighter system requirements and desired transparency performance capabilities. A literature survey will be conducted to gather information on existing system transparencies. Test criteria will be extracted from current system transparencies to determine effects of specific requirements. Trade studies will be accomplished to determine the optimum design and test requirements/specifications. Limited missile fragment impact tests will be conducted against conventional transparencies.

ADDENDA: Supporting agency address is: AF Flight Dynamics Laboratory FER, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense, Air Force

1.0012, EVALUATION OF EMERGING CONCEPTS FOR NAVAL AIRCRAFT-SHIP INTERFACES
W.T. MILLER, U.S. Navy, Air Vehicle Technology Dept., *Warminster, Pennsylvania* 18974 (DN681206)

To conduct a case-by-case review of aircraft concepts submitted to the naval aviation community. This first order of magnitude type review shall include the technical feasibility of the concept and an estimate of the operational utility of the concept for naval and marine forces.

It is planned that this work unit will cover an evaluation of five or six technical concepts per year and that each evaluation shall be conducted during a four-week time period. An additional week will be required for review and forwarding of the analysis. The results of each evaluation will be presented to AIR-03P3 via presentation and a NavAirDevCen letter with technical data enclosures. Formal reporting on any concept evaluated will be provided only upon specific request.

ADDENDA: Supporting agency address is: Naval Air Systems Command, Advanced Systems Concepts Div, Washington, DC 20361

SUPPORTED BY U.S. Dept. of Defense, Navy

1.0013, ADVANCED TECHNOLOGY WING STRUCTURAL COMPONENT
W.A. POINDEXTER, L T V Aerospace Corporation, *Dallas, Texas* 75222 (DF138220; F33615-76-C-3138)

Increasing acquisition and life cycle costs of aircraft have focused attention on the development and demonstration of new airframe structures technology which will provide reduced ownership cost while improving structural durability and vehicle

performance. The objective of this effort is to demonstrate feasibility of selected low-cost advanced wing box structural concepts applicable to future tactical and strategic aircraft. The wing design to be investigated will be a variable camber supercritical wing which offers increased aircraft performance through the collective influence of advanced aerodynamics structures and flight control. Program results will be directly applicable to the development of an advanced technology wing for installation and flight test evaluation on the TACT/F-111 and other aircraft.

Structural wing box components representing a 10 ft. inboard section of a variable-camber supercritical wing configuration will be designed, fabricated, and tested to show concept feasiblity. Acquisition and life-cycle cost comparisons will be generated against conventional machined aluminum wing box structure.

ADDENDA: Supporting agency address is: AF Flight Dynamics Laboratory FBSB, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense, Air Force

1.0014, THE IMPORTANCE OF PROVIDING STEREOSCOPIC VISION IN TRAINING FOR NAP-OF-THE-EARTH FLIGHT

D.E. ERWIN, U.S. Army, Res. Inst., *Arlington, Virginia* 22209 (DA644182)

The Army has begun to design, develop, and procure flight simulators for the Cobra attack helicopter. The rationale for this rather significant investment is that flight simulators are both cost-and training-effective. The cost-effectiveness of flight simulation is unquestionable. Training effectiveness is not, unfortunately, as clear-cut a matter. The visual display in simulators currently being procured is bioptic--essentially that seen if the air space was monitored with one eye. This means that the pilot-trainee learns the demanding perceptual/motor coordination required for successful nap-of-the-earth (NOE) flight with only a subset of the cues for depth perception normally available in the 'two-eyed' world. Considering the criticality of highly proficient obstacle avoidance ability for safe and tactically acceptable NOE flight, the Army cannot afford to train minimally proficient performance.

The research program will seek to determine the criticality of stereoscopic cues for depth perception to high proficiency NOE flight, and will provide a recommendation regarding either design changes or new training strategies to insure the development of maximally efficient depth perception in pilots required to fly NOE.

ADDENDA: Supporting agency address is: DA ARI for Beh & Soc Sci, Orgns and Systems Rsch Lab, 1300 Wilson Blvd, Arlington, VA 22209

SUPPORTED BY U.S. Dept. of Defense, Army

ASTRONAUTICS

Includes Astronautics (general); Astrodynamics; Ground Support Systems and Facilities (space); Launch Vehicles and Space Vehicles; Space Transportation; Spacecraft Communications; Command and Tracking; Spacecraft Design, Testing, and Performance; Spacecraft Instrumentation; and Spacecraft Propulsion and Power. For Related Information See Also Aeronautics.

2.0001, SKYLAB CONTAMINATION RESULTS EXPERIMENTS

D. SCHUERMAN, State University of New York, Graduate School, *Albany, New York* 12203 (NAS 8-32485)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Organization & Management Office, Office of University Affairs

CHEMISTRY AND MATERIALS

Includes Chemistry and Materials (general); Composite Materials; Inorganic and Physical Chemistry; Metallic Materials; Nonmetallic Materials; and Propellants and Fuels.

3.0001, CARBORANE BURNING RATE MODIFIERS FOR SOLID PROPELLANTS

W.E. HILL, Auburn University, School of Chemistry, *Auburn, Alabama* 36830 (DN590583; N00024-75-C-5318)

To perform research on carborane compounds for use as propellant burning rate catalysts. Three main problems will be investigated: (1) possibility of migration from the propellant, (2) undesirably high melting points, and (3) low yield synthesis.

To prevent migration, existing binders will be modified by using carboranyl plasticizers which react with double bonds of the polymers on curing. Hydroxy terminated polybutadiene (HTPB) and carboxy terminated polybutadiene (CTPB) polymers will be reacted with functional carboranes to make polymers containing boron which should not migrate easily. Silyl carboranes containing Si-Si bonds or Si-C bonds will be synthesized. These compounds should yield high burning rates with less carborane which should be less volatile. Difunctional carboranyl isocyanates and expoxides for use as curing agents will be synthesized. Meta-isomers of carborane derivatives will be prepared and compared with their ortho analogs in an effort to lower the melting point. Carboranes will be synthesized from acetylenes for improved yield.

ADDENDA: Supporting agency address is: Naval Sea Systems Command, Washington, D. C. 20362

SUPPORTED BY U.S. Dept. of Defense, Navy

3.0002, A FUNDAMENTAL STUDY OF THE PROCESSING OF OXIDE DISPERSION STRENGTHENED METALS

W.D. NIX, Stanford University, School of Engineering, *Palo Alto, California* 94305 (DF046250; AF-AFOSR-3128-77)

AF function - the demanding requirements of high-performance aerospace vehicles make clear the need for materials with premium mechanical properties. Dispersion strengthened alloys are being used in the hottest sections of some high-performance gas turbine engines and their use is expected to become even more widespread in aerospace systems of the future. Opportunity - with the recent discovery and development of mechanical alloying, it is now possible to dispersion strengthen virtually any alloy of interest. Objective - this research will determine the mechanical alloying and deformation processing factors that are most important in producing homogeneous oxide dispersions together with elongated grain structures. How work contributes - this information is required to develop sufficient understanding of the mechanisms responsible for elongated grain structures that guidelines might be written for producing these desirable microstructures in oxide dispersion strengthened superalloys of interest to the Air Force.

A fundamental investigation will be undertaken to determine the effects of oxide content, and thermal and mechanical history on the shapes and crystallographic orientations of recrystallized grains in various particle strengthened alloys (both model systems and Ni-Cr-Al systems).

ADDENDA: Supporting agency address is: AF Office of Scientific Research NE, Bldg 410, Bolling AFB, DC 20332

SUPPORTED BY U.S. Dept. of Defense, Air Force

3.0003, GAS PHASE KINETIC, MECHANISTIC, AND PHOTODISSOCIATION STUDIES OF ATOMS, RADICALS, AND SMALL MOLECULES

J.N. PITTS, Univ. of California, School of Natural & Agric. Sc., *Riverside, California* 92502 (CHE76-10447 A01)

A continuation of a basic research program is planned which involves studies of the rates, mechanisms, and products of the gas phase reactions of oxygen atoms, hydrogen atoms, SH radicals, and ozone, and the photodissociative processes of ozone, chlorine dioxide, and alkyl nitrates. The mechanism and products of the ozone-olefin-sulfur dioxide will be studied, using a 120-meter path-length infrared cell, coupled to a Fourier infrared interferometer. Combined gas chromatography/mass spectrometric analysis will also be used to confirm product identifications. This major equipment is currently on hand and available for these studies. Rate constants for the abstraction reactions of O P3 atoms with olefins and aromatic hydrocarbons and rate constants for the reaction of H atoms, and SH radicals with organic and inorganic

(for SH only) species will be determined, using an existing flash photolysis/resonance fluorescence apparatus. Using our tunable dye laser, photodissociative processes leading to oxygen atom production from ozone, chlorine dioxide, and alkyl nitrates will be studied using resonance fluorescence/photon counting techniques. The results of these studies are not only of fundamental interest, but are also of importance for use in chemical kinetic computer models of the chemistry of the polluted lower and upper atmospheres. This work is a continuation of that currently supported by Foundation Grant GP-38053X.

SUPPORTED BY U.S. National Science Foundation, Div. of Chemistry

3.0004, QUANTITATIVE ANALYSIS OF SOLUTE SEGREGATION IN ALLOYS BY TRANSMISSION ELECTRON MICROSCOPY

J.J. HREN, State University of Fla. Sys., Florida Eng. & Ind. Expt. Sta., *Gainesville, Florida* 32601 (EY-76-S-05-4311)

A general routine has been developed for the computer simulation of defect images in transmission electron microscopy. A catalog of images under various experimental conditions for small dislocation loops is being completed using isotropic elasticity and two-beam conditions. The catalog will characterize images in FCC and BCC materials and be used to predict optimum image contrast for experimental identification. Extension to the anisotropic elastic solutions will be made with an emphasis on small defects in irradiated zirconium and molybdenum. The catalog will be published and made generally available. A bibliography of papers on image contrast from defects will also be completed and published. Development of a computer program for the simulation of grain boundary structures for multi-beam conditions will be vigorously pursued.

SUPPORTED BY U.S. Energy Research & Development Admin., Div. of Physical Research

3.0005, NUCLEAR SPIN-LATTICE RELAXATION STUDIES AND THEIR APPLICATION TO CHEMICAL PROBLEMS

G.C. LEVY, State University of Fla. Sys., School of Arts & Sciences, *Tallahassee, Florida* 32306 (CHE76-81738)

A high-sensitivity 21-35 kilogauss multi-nuclei Fourier transform NMR spectrometer is under construction, and will make possible measurements of the spin-lattice relaxation time and nuclear Overhauser effect in natural abundance N-15 and dilute natural abundance carbon-13 samples. Liquid dynamics, structure, and intramolecular segmental motions will be investigated for polymer systems. Small molecules associated with polymers, solvated ion pairs, and hydrogen bonding in systems containing OH and NH groups will also be studied, including investigations of the effects of variation in concentration. The effects of paramagnetic relaxation reagents on nitrogen-15 nuclei will also be studied. Models of translational diffusion processes in liquids will be tested. This research represents a continuation of that currently supported by CHE-7400332.

SUPPORTED BY U.S. National Science Foundation, Div. of Chemistry

3.0006, ALLOY STRENGTHENING DUE TO ATOMIC ORDER

M.J. MARCINKOWSKI, Univ. of Maryland, School of Engineering, *College Park, Maryland* 20740 (EY-76-S-05-3935)

The study of the relationship between atomic ordering and mechanical properties will be continued in two rather new directions. In the first instance, more generalized theories of deformation will be developed so as to encompass arbitrarily large plastic strains. Secondly, the problem of crack formation and propagation will be formulated in terms of various dislocation arrays and solved by means of computer methods.

RESULTS: It has been shown that the methods of differential geometry provide the most concise mathematical technique for understanding the plastic behavior of metals and alloys. Furthermore, the external surfaces of such materials have been shown to play an important role in describing generalized plastic deformation.

SUPPORTED BY - U.S. Energy Research & Development Admin., Div. of Physical Research

3.0007, EFFICIENT AB INITIO METHODS FOR COMPOUNDS OF SECOND AND THIRD ROW ELEMENTS

H.F. KING, State University of New York, School of Arts & Sciences, *Buffalo, New York* 14214 (CHE76-21995)

This project will develop new techniques for greatly reducing the cost of ab initio quantum chemical calculations. Of central importance are calculations for which d, f and higher angular momentum functions play a major role, such as SCF calculations for compounds of heavy elements, and extended basis set calculations with correlated wave-functions for compounds of lighter elements. Integration techniques based on the properties of a new system of orthogonal polynomials called Rys polynomials will be further developed as a general approach to the evaluation of molecular integrals over Gaussian basis functions. This will be coupled with a study of efficient basis set contraction schemes and the use of molecular symmetry, to reduce substantially integral evaluation times. The Rys polynomial method will also be extended to wider class of integrals. Such integral evaluation schemes will be joined both to self-consistent field molecular orbital and to multi-configuration self-consistent field models to produce efficient computer techniques for accurate general electronic structure problems. Applications will be made to a number of chemical problems involving compounds of second- and third-row elements, including some conjectured molecules containing double bonds between aluminum and nitrogen.

SUPPORTED BY U.S. National Science Foundation, Div. of Chemistry

3.0008, PERCOLATION CONTROLLED TRANSPORT PROPERTIES IN SEMICONDUCTING GLASSES

D.G. AST, Cornell University, School of Engineering, *Ithaca, New York* 14850 (DMR75-03850)

This research will be a study of the compositional dependence of electronic transport properties in semiconducting glasses. Preliminary measurements by the principal investigator suggested that effective medium percolation theory correctly describes the compositional dependence of the conductivity in the As-Te system. This research has as its objectives: (a) to analyze in detail phenomena in the vicinity of the percolation threshold in order to discriminate between bond, correlated bond and domain percolation theories; (b) to separate carrier concentration from mobility effects by means of drift mobility measurements; (c) to investigate the relation between structure and applicability of percolation theory by varying the specimen preparation method (both evaporated and quenched materials); (d) to analyze recent conduction theories in terms of their compatibility with effective medium percolation theory; and (e) to extend the percolation approach to binary chalcogenide systems, in addition to amorphous AsxTel-x.

In addition to studying the electrical properties, an investigation of the structure will be undertaken by transmission electron microscopy to establish the presence or absence of phase separation.

SUPPORTED BY U.S. National Science Foundation, Div. of Materials Research

3.0009, X-RAY DIFFRACTION AND SCATTERING IN CRYSTALLINE AND AMORPHOUS SOLIDS

B.W. BATTERMAN, Cornell University, School of Engineering, *Ithaca, New York* 14850 (DMR73-02384 A01)

The research program supported by NSF grant DMR-73-02384 will be continued. This includes a continuation of the studies of vibrational amplitudes, spatial distributions and anharmonic motion of valence electrons in silicon through the observation of the forbidden reflections. The unique properties of synchrotron radiation of the Cornell 12 GeV electron synchrotron will be used as the X-ray source for the diffraction experiments. The high intensity and high natural collimation of the beam should provide a unique opportunity to study these very weak reflections. The very low angle X-ray scattering of amorphous materials which have displayed unusual thermal properties at very low temperatures will also be investigated.

SUPPORTED BY U.S. National Science Foundation, Div. of Materials Research

3.0010, TRACE CHEMICAL ANALYSIS METHODOLOGY
W.D. ROSS, Monsanto Research Corporation, *Dayton, Ohio* 45407 (DF680750; F33615-75-C-1130)

AF function - analytical methodology, detection and quantitation of trace substances in AF operations. Deficiency - need for qualitative and quantitative data on potential environmentally harmful substances generated by AF operations and for ultra-sensitive and selective methods for other significant AF trace analysis requirements. Research -investigation of new, more sensitive, more selective, more cost-effective, and more reliable analytical methods capable of providing timely quantitative data for specific chemical analyses of AF importance. How research contributes - provides methodology to obtain data for assessing the extent of AF pollution problems, for establishing safe and 'environmentally acceptable' operation conditions, and for preparing environmental impact statements for present and future AF systems and operations. Provides basic methodology for trace analysis of materials used in AF operations (e.g., wear metals in aircraft lubricating oil, identification of foreign matter in hydraulic fluids, etc.)

ADDENDA: Supporting agency address is: AF Materials Laboratory MBT, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense, Air Force

3.0011, PHYSICAL-CHEMICAL STUDIES OF TRANSURANIUM ELEMENTS
J.R. PETERSON, Univ. of Tennessee, School of Liberal Arts, *Knoxville, Tennessee* 37916 (EY-76-S-05-4447)

The program provides for continuing investigations of the basic physical-chemical properties of the transuranuim elements and the interpretation and correlation of the results obtained. New knowledge is expected to be accumulated in the role of the 5f electrons in bonding in actinide elements and compounds, the relationships of metallic structures to metallic valence and radius, the extent and magnitude of the actinide contraction, the magnetic, thermodynamic, spectroscopic, and crystallographic properties of these materials as related to general theories, the effect of self-irradiation on chemical and physical properties, and in general, the range of validity of the actinide hypothesis. Specific projects include development of high-pressure X-ray diffraction and SQUID apparatus for use with actinide materials; characterization of the behavior of Cf(III) and Es(III) in various halide matrices before and after treatment with H2; study of the effects of parent, daughter, and granddaughter relationships on solid-state behavior of heavy actinide ions; polarographic study of Es(III) reduction in acetonitrile; preparation of elemental Em-248 for high-pressure X-ray diffraction, magnetic susceptibility, and heat of solution studies; refinement of a solution microcalorimeter; spectrophotometric and X-ray diffraction analyses of 248CmF4; improvement in the acquisition, storage, work up, and analysis of single-beam spectrophotometric data.

SUPPORTED BY U.S. Energy Research & Development Admin., Div. of Physical Research

3.0012, BIPROPELLANT CONTAMINATION 5 LBF
R.E. ALT, Arnold Research Org. Inc., *Tullahoma, Tennessee* 37389 (DF421010; F40600-76-C-0001)

The CONTAM computer code was developed by the AFRPL for predicting contamination from a bipropellant thruster system and for assessing the effects of the contaminants on sensitive spacecraft surfaces. This code models the contamination production within the combustion chamber, transport with the nozzle plume, and surface property changes due to contaminant impingement and deposition. Although the code was been used in its present form for several years, it has not been verified and the obtainable accuracies have not been established. In order to assess the accuracy of the code and to determine where modifications are required, exhaust plume properties near the exit plane, exhaust specie mass deposition rates throughout the plume, and the degrading effects to the performaance of various spacecraft surfaces exposed to the plume must be measured. The contaminants must be determined over wide ranges of design thrust, chamber pressure, pulsing duty cycle, valve lead-lag timing, injector types, and thruster chamber configurations in order to assess the prediction accuracy of CONTAM for varying thruster conditions.

Contamination measurements on this program will be made on a 5.0 lbf bipropellant engine. The engine will be fired in a high-altitude space simulation chamber, and the exit plane properties, plume mass deposition rates, and the effects of the plume on various spacecraft surface will be measured. The mass deposition rate manning will be obtained with QCMS mounted throughout the plume and with other in situ optical techniques.

ADDENDA: Supporting agency address is: Arnold Engineering Development Center, Arnold AFB, TN 37389

SUPPORTED BY U.S. Dept. of Defense, Air Force

ENGINEERING

Includes Engineering (general); Communications; Electronics and Electrical Engineering; Fluid Mechanics and Heat Transfer; Instrumentation and Photography; Lasers and Masers; Mechanical Engineering; Quality Assurance and Reliability; and Structural Mechanics. For Related Information See Also Physics.

4.0001, DIGITAL TELEVISION SYSTEM FOR OPTICAL TELESCOPES
G.R. GILBERT, Univ. of Arizona, Steward Observatory, *Tucson, Arizona* 85721 (AST75-00525 A04)

The research output of a modern telescope depends in part upon the efficiency and inherent accuracy of the device for detecting the light. Improvement of such detectors can give a many-fold improvement in the capability of present telescopes.

Development of an efficient and accurate photon-counting imaging system will continue at the University of Arizona. A new type of detector package will be incorporated to provide good sensitivity at ultraviolet wavelengths. The speed of the control and data handling electronics will be increased to provide a greater dynamic range.

The complete system will be tested extensively at the telescope and simple operating routines will be incorporated into the control software to make the system easily usable by all potential users.

This is a continuation of research previously supported under NSF grant AST 76-00525.

SUPPORTED BY U.S. National Science Foundation, Div. of Astronomical Sciences

4.0002, TURBULENCE STRUCTURE IN COMPLEX FLOWS
D.M. MCELIGOT, Univ. of Arizona, School of Engineering, *Tucson, Arizona* 85721 (ENG73-03513 A02)

Experimental and numerical studies of complex turbulent and transitional flows will be continued. Three situations are to be examined: (1) vertical airflow through a circular tube with strong heating, (2) horizontal forced flow of air or water past a heated horizontal surface, and (3) a radially converging flow of water or air between two parallel disks. These basics are idealizations of applications occurring in gas-cooled fast breeder reactors, solar heating and electrical power-plant thermal pollution, and geothermal energy reservoirs, respectively.

The goal is to develop the ability to reliably predict mean temperature and velocity profiles and wall parameters, such as heat-transfer coefficients and friction factors, in turbulent and transitional flows subject to the following important complications: interacting shear layers, lateral convergence, buoyancy or streamline curvature, longitudinal acceleration and severe variation of molecular transport properties. Time-mean distributions of the velocities, temperature, Reynolds shear stress and turbulence heat flux are to be measured with hot-wire anemometry, laser Doppler anemometry and resistance thermometry in conjunction with digital data acquisition. The wall region and its viscous (buffer) layer will be emphasized. These data will be compared to existing turbulent predictive methods and will be documented to serve as useful tests of advances in turbulence models hypothesized later. Conditional sampling techniques will also be

employed with transient measurements of these quantities to provide physical bases for improvement and/or extension of current predictive methods.

This is a renewal of NSF Grant ENG-7303513.

SUPPORTED BY U.S. National Science Foundation, Div. of Engineering

4.0003, PLASMA CROSS-SECTION MEASUREMENTS RELEVANT TO ATMOSPHERIC-PRESSURE HIGH-POWER PULSED DF/HF CHAIN LASERS

P. MAHADEVAN, Aerospace Corporation, *El Segundo, California* 90245 (ENG75-22434)

This research involves an experimental and theoretical program to measure critical unknown plasma cross sections and to incorporate overall inelastic rates calculated from these cross sections into an existing, comprehensive computer code for modeling high-power, electrically initiated F2-D2(H2) lasers. The program seeks to obtain an understanding of the collision processes in a 1-atm. discharge initiated F2-H2(D2) laser. Among the unique features of this laser is the dramatically higher electrical efficiency of the system (148% in comparison with the best pulsed CO2 or CO lasers). The research, which is primarily basic in nature, will lead to a better understanding of the processes and provide a more realistic capability for modeling the performance of the laser system.

SUPPORTED BY U.S. National Science Foundation, Div. of Engineering

4.0004, DIAGNOSTIC TECHNIQUES FOR MOLECULAR MULTIPHOTON ABSORPTION OF IR LASER RADIATION

C. WITTIG, Univ. of Southern California, School of Engineering, *Los Angeles, California* 90007 (ENG76-82560)

This research involves a series of diagnostic experiments to measure fundamental processes in molecular multiple photon IR absorption. This phenomenon, which can lead to dissociation of molecular species on a collisionless time scale, has been shown to be useful for laser isotope separation and offers the possibility of laser controlled chemistry. The proposed experiments address the following two questions. First, what is the distribution and fate of the vibrational energy that a molecule gains from the laser field in the absence of photodissociation? Second, what are the specific product channels for photodissociation and how can these product channels be monitored and controlled?

SUPPORTED BY U.S. National Science Foundation, Div. of Engineering

4.0005, THEORETICAL AND EXPERIMENTAL STUDIES ON NOBLE GAS ION LASERS WITH STABLE MAGNETIC CONFINEMENT

S. LIN, Univ. of California, School of Engineering, *San Diego, California* 92038 (ENG76-02274)

This research concerns a theoretical and experimental study of efficient noble gas ion laser generation using stable magnetic confinement. In the theoretical study, it is proposed to extend the previous studies for purely wall-confined ion laser discharges, and the more recent work on wall-confined ion lasers with uniform axial magnetic field confinement, to the cause of purely magnetic-field confined ion laser discharges in a linear, multipole, minimum-B field configuration. In the experimental study, it is proposed to continue the study of the discharge and lasing characteristics of a two-meter long, low-pressure discharge apparatus with independently adjustable hexapole and axial magnetic fields of up to 3 kilogauss intensity. The experimental results will be compared with theory wherever appropriate. This is a continuation of previous research supported by NSF under grant number GK-40726 (ENG-7303607).

SUPPORTED BY U.S. National Science Foundation, Div. of Engineering

4.0006, ENERGY DISPOSAL IN LASER EXCITED ELECTRONIC STATES

S.R. LEONE, Univ. of Colorado, Graduate School, *Boulder, Colorado* 80302 (CHE76-22600 A01)

A tunable visible-ultraviolet laser will be used to study energy disposal in electronically excited states of atoms and molecules. Molecular fragmentation and predissociation will be investigated in the interhalogens and methyl nitrite. Electronically and vibrationally excited species are detected in the fragmentation products by infrared emission. Complete photodissociation yields of excited species versus wavelength will be obtained. Evaluation of the quantum yields for 'collisional release' will be refined. Electronic quenching will be studied with detailed mapping of the excited states (vibrational and electronic) which are produced. Several fundamentally new experiments will be undertaken to detect unobserved states in the interhalogen molecules, and to look for near-continuum infrared emission from highly excited methyl nitrite.

SUPPORTED BY U.S. National Science Foundation, Div. of Chemistry

4.0007, FAILURE OF METAL MECHANICAL JOINTS UNDER BLAST LOADS

C.A. ROSS, State University of Fla. Sys., School of Engineering, *Gainesville, Florida* 32611 (DF045850; AF-AFOSR-3157-76)

AF function - to add needed knowledge in the area of aerospace vehicles, propulsion systems and weaponry. The failure of structural elements because of damage by dynamic blast loads in phenomenologically complex and improved modeling methods are badly needed. Deficiency - in aerospace applications, the boundaries of many structural elements are bolted or riveted joints. As such, these joints are not to be traditionally modeled as fixed, simply supported or free conditions. In addition, computer modeling of these complexities has proven to be cost prohibitive. Therefore, a deficiency exists and work must be done to overcome same. Objective - this research will use energy methods as a prerequisite study procedure for analytical modeling of joint degradation from blast loads. Through the use of energy methods and analytical modeling, a better understanding of mechanical joints should evolve. How work contributes - additional scientific information about joints will serve to improve aerospace vehicles, propulsion systems and weaponry devices. In this way, better Air Force systems will be the long-range result.

Dr. Ross proposes to initially attack the problem by doing slow-to-intermediate strain rate studies using conventional mechanical property test methods. Concurrently, an in-depth literature search is also planned.

ADDENDA: Supporting agency address is: AF Office of Scientific Research NA, Bldg 410, Bolling AFB, DC 20332

SUPPORTED BY U.S. Dept. of Defense, Air Force

4.0008, ESTIMATION OF RELIABILITY FUNCTIONS UNDER TRUNCATION & RELATED PROBLEMS

T. CACOULLOS, Univ. of Athens, *Athens, Greece* (DA0C9348; DAERO12474G0078)

This work on reliability functions will be used to attempt to improve our confidence bounds in studying devices involving fluidic, optical, mechanical and electrical systems. It should be particularly useful in testing of fuzes, multistage arming devices and avionic systems.

Point and interval estimation of reliability functions expressed as products and/or ratios of parameters in truncated power series distributions associated with the reliability of the individual components of a multi-component system will be studied. Both, 'attribute failure' and multistate 'multinomial' models will be considered. The main techniques to be used are primarily through conditional distributions involving only the unknown reliability functions of the system and, secondly, through compounding, e.g., a truncated poisson and a bernoulli distribution. Probabilistic problems, such as characterizations of discrete distributions, will also be investigated.

ADDENDA: Supporting agency address is: DARCOM Research & Standardization Group (Europe), Box 15 FPO, New York 09510

SUPPORTED BY U.S. Dept. of Defense, Army

4.0009, RADAR

K.H. SHREEVE, U.S. Dept. of Commerce, Equipment Development Lab., *Silver Spring, Maryland* 20910 (8AA830)

TECHNICAL OBJECTIVE: Cooperative effort to study new techniques and equipment to improve the NWS weather radar facility and usefulness. EDL, in cooperation with the National Severe Storms Laboratory (NSSL), Norman, Oklahoma; SDO's Techniques Development Laboratory (TDL), OTS, OM&O, and others, will work to improve hydrologic and meteorologic output products, communications, and to establish new equipment and technique requirements and specifications.

APPROACH: 1. Continue the joint experimental program with NSSL, OTS, and OM&O to establish an operational Doppler radar configuration and field techniques. 2. Experiment with the signal Variability Processor (SVP--previously referred to as the API, Anomalous Propagation Indicator) to establish the best use of pulse-to-pulse difference techniques. 3. Use modified Radar Derived Image Transmittter (RADIT) equipment to create and evaluate new radar presentations that can be used on the new RADAP (Radar Data Processor) system/RADIT equipment.

PROGRESS (July 1975 to October 1976): A new cooperative effort between the NWS and NOAA's Environmental Research Laboratory in using Doppler radar techniques developed by ERL's National Severe Storms Laboratory at Norman, Oklahoma to provide advance tornado detection and tracking in the field was started. A Signal Variability Processor (SVP) to automatically identify non-weather echoes caused by anomalous propagation was field tested. The Radar Derived Image Transmitter (RADIT) equipment completed its experimental trial at the Pittsburgh, Pennsylvania weather radar site. RADIT successfully demonstrated digital techniques to replace the Weather Bureau Radar Remoting (WBRR) equipment and improve the output facsimile pictures. Technical specifications for the following equipment were prepared in cooperation with Office of Meteorology and Oceanography, OTS, and Office of Hydrology: 1. Digital Video Integrator Processor (DVIP), a digital replacement for the analog Video Integrator and Processor (VIP); 2. Radar remoting equipment for FAA's long-range Air Route Surveillance Radar (ARSR) into the Air Route Traffic Control Centers (ARTCC). (Text Abridged)

SUPPORTED BY U.S. Dept. of Commerce, National Oceanic & Atmospheric Admin., National Weather Service

4.0010, DEMONSTRATION OF THE BLUE SPIKE MODULATOR

J.M. WEINBERG, Block Engineering Incorporated, *Cambridge, Massachusetts* 02139 (DF047110; F49620-77-C-0036)

AF function - it is proposed to undertake a short series of experiments to demonstrate the predicted performance benefits of the blue spike modulator. The benefits of the concept are, specificity to blue spike emission, immunity to rapid temporal changes in the spectral content or intensity of the background and a sensitivity limited only by the photon statistical fluctuations of the background. The specificity of the sensor makes it a candidate system for detection and acquisition of targets ranging from strategic aircraft to cruise missiles. Opportunity - the blue spike modulator is a proprietary sensor concept proposed to detect exhaust plume emissions in the infrared. Previous experimental and analytical work has confirmed the operational concepts of the sensor. An experimental demonstration is needed to confirm the concept. Objective - the goal of this effort is to provide a limited experimental confirmation of the predicted specificity and background immunity of the blue spike modulator. Contribution - as a candidate system for the detection of strategic targets, the response is immune to background changes, i.e., the system will not alarm due to natural processes such as cloud motion or rapid thermal variations. Also, the sensor will not impose undue constraints on pointing stability, i.e., accidental spatial scans will not cause system alarms. The sensitivity limit suggests that no better system is possible.

Experiments in two major groupings are planned for the blue spike modulator. The first set will demonstrate specificity. The modulator will be pointed to view an arbitrary, constant background. A source will be viewed in this background to demonstrate the ability of the technique to separate blue spike signals from background. A variety of backgrounds will be investigated. The second set of experiments are intended to demonstrate immunity to temporal variations in the background intensity or spectral content. The intensity of clutter sources will be changed as rapidly as practicable, and/or a large moving mirror behind the source will be used to simulate spatial scanning of cluttered natural background.

ADDENDA: Supporting agency address is: AF Office of Scientific Research NP, Bldg 410, Bolling AFB, DC 20332 .

SUPPORTED BY U.S. Dept. of Defense, Air Force

4.0011, STUDY TO EVALUATE AND TEST DEFINED ANTENNA DESIGNS FOR SELECTION OF THE SHUTTLE IMAGING RADAR ANTENNA

D.G. HENRY, New Mexico State University, Graduate School, *Las Cruces, New Mexico* 88001 (NAS 9-95479)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Organization & Management Office, Office of University Affairs

4.0012, CONSTITUTIVE REPRESENTATION AND LIFE PREDICTION METHOD FOR RENE 95

D.C. STOUFFER, Univ. of Cincinnati, School of Engineering, *Cincinnati, Ohio* 45221 (DF045940; AF-AFOSR-3101-77)

AF function - durability and life cycle costs of aerospace flight vehicles is of major concern to the Air Force. Deficiency - technology base uncertainties exist in the reliability of predicting fracture and fatigue damage occurring in Air Force airframe and engine structures. Objective - the objective of this research is to understand through material constitutive behavior the interaction of creep and fatigue in the failure process. How work contributes - this research contributes to the development of improved Air Force damage tolerant design criteria.

The principal investigator will investigate improved constitutive equation representations accounting for creep and plastic strain effects. Rene 95 will be used as particular material for this study. Research will focus on rate effects and extension of strain-range partitioning life prediction methods to include this effect.

ADDENDA: Supporting agency address is: AF Office of Scientific Research NA, Bldg 410, Bolling AFB, DC 20332

SUPPORTED BY U.S. Dept. of Defense, Air Force

4.0013, NONPARAMETRIC AND ROBUST TESTING FOR SIGNAL DETECTION

S.A. KASSAM, Univ. of Pennsylvania, Graduate School, *Philadelphia, Pennsylvania* 19101 (DF046510; AF-AFOSR-3154-77)

AF function - communications and signal processing and instrumentation. Deficiency - there exists a definite need for research in the area of nonparametric and robust statistical techniques which will result in simple and effective tests applicable to practical problems in communication and signal detection and processing. Objective - develop nonparametric and robust testing techniques which can maintain performance at some predetermined level for large classes of probability distribution functions. How work contributes - this research should lead to better design of communication systems and signal processing techniques.

The proposed research will be concerned with various aspects of nonparametric and robust testing methods for signal detection, with major emphasis on nonparametric detection. The research will emphasize the development of detectors based on conditional tests. It is also proposed to study some aspects of nonparametric and robust array detectors. Also investigation of sequential detectors based on the conditional tests will be considered. Recently, some general results on robust tests for the detection of a known signal of contaminated non-gaussian noise have been obtained by the principal investigator. It is proposed to extend these results to the two-input and multi-input cases for the detection of a common random signal in contaminated noise.

ADDENDA: Supporting agency address is: AF Office of Scientific Research NM, Bldg 410, Bolling AFB, DC 20332

SUPPORTED BY U.S. Dept. of Defense, Air Force

4.0014, THIN FILM ACOUSTOOPTIC DEVICES
C.S. TSAI, Carnegie Mellon University, Inst. of Technology, *Pittsburgh, Pennsylvania* 15213 (DF046900; AF-AFOSR-3187-77)

AF function - microwave solid state electronic devices are essential components of Air Force electronic countermeasures, communications and signal processing systems. Opportunity - it is now recognized that integrated/fiber optics will have important applications in wideband multichannel communication and information processing. In order to achieve applications in these areas, high-performance thin film active devices are needed, and thin film acoustooptic devices appear to be very promising for this purpose. Objective - the main objectives of this research are to investigate several thin film acoustooptical devices which have potential for application to future wideband multichannel integrated/fiber optic signal processing and communication systems. How work contributes - specifically, this research will investigate several interaction mechanisms between surface acoustic waves (fixed or variable frequency) and guided light waves (fixed or variable frequency) in order to deflect or steer the light beam. The work will also consider wideband electrical matching to multiple surface acoustic wave (SAW) transducers and a tunable photodetector using SAW.

The proposed research problem will consist of the seven sub areas described below. Very high speed light beam deflection and switching. Theoretical and experimental studies will be used to determine the various device and systems aspects of the deflectors with specific reference to high-speed deflection/switching. Spectrum analysis of very wideband rf signals. Implementation of wideband multiple SAW transducer configurations with lithium niobate, gallium arsenide and silicon will be examined. Wideband rf signal processing. The objective here is to determine the ultimate performance figures of such a convolver with respect to dynamic range and time-bandwidth product. Wideband electrical matching to multiple SAW transducers. Studies will be made to obtain better electrical matching to the multiple transducer needed for their wide bandwidth applications in the first three sub areas. Optical time-multiplexing and demultiplexing. Experiments using various kinds of optical waveguide materials/structures will be carried out in order to determine the ultimate capability of the thin-film a-o sequential switch with respect to optical time-multiplexing/demultiplexing in multichannel fiber/integrated optical communications systems. (Text Abridged)

SUPPORTED BY U.S. Dept. of Defense, Air Force

4.0015, TRANSPORT PROPERTIES OF ION IMPLANTED INP
T.M. HENG, Westinghouse Electric Corp., *Pittsburgh, Pennsylvania* 15235 (DF040310; F44620-75-C-0034)

AF function - microwave solid state electronic devices are essential components of Air Force reconnaissance, electronic countermeasures and communications systems. Deficiency or opportunity continuing systems requirements demand improvements in power, frequency, and noise properties for high-frequency operation. InP is a promising microwave material, and control over the impurity doping profile in this material presents the opportunity of higher performance devices. Objective - the objective of this research is to investigate the utility of ion implantation in InP for the selective control of profile concentration and junction formation. How work contributes - the control and understanding of ion implantation in InP will allow for the fabrication of high-performance microwave devices requiring fine doping profile tolerances.

Both n-type (Si and Sn) and p-type (Zn) ions will be implanted into InP. The various conditions of the encapsulation, implant and subsequent anneal will be optimized in order to achieve maximum carrier mobility and junction integrity. The electrical and metallurgical properties of the implanted layers will be evaluated by means of hall, differential and thermally stimulated capacitance, secondary ion mass spectrometry, and optical measurement techniques. The back scattering of He ions will be used to study the out-diffusions of In and P, into the encapsulating film in order to determine the best encapsulant and best conditions of anneal time and temperature. The recoil implantation of III- or V-column elements will be employed in an effort to obtain an extremely shallow implant and control the troublesome surface states of InP. The depth and approximate concentration of the implant will be measured by means of the back scattering technique.

ADDENDA: Supporting agency address is: AF Office of Scientific Research NE, Bldg 410, Bolling AFB, DC 20332

SUPPORTED BY U.S. Dept. of Defense, Air Force

4.0016, SPECTROSCOPIC STUDIES OF ULTRAVIOLET LASING TRANSITIONS IN DIATOMIC MOLECULES
J. TELLINGHUISEN, Vanderbilt University, School of Arts & Sciences, *Nashville, Tennessee* 37232 (E(40-1)-5005)

The diatomic noble-gas halides and the halogens have become the subject of considerable attention in recent months, as several laboratories have achieved lasing on UV transitions in eight of these molecules (XeBr, XeCl, XeF, KrF, KrCl, ArF, I2, Br2). The present proposal describes continuing research on the spectroscopy of these systems, specifically the laser transitions in XeF, XeCl, ArF, I2, and Br2. The goal of the work is a fundamental understanding of these molecules and their transitions, including a description of the various electronic states, their potential curves and electronic structures. The work will concentrate on the analysis of discrete and diffuse spectra obtained under a variety of conditions, and will stress modern computational techniques of analyzing these data.

RESULTS: (1) Vibrational analysis of two transitions in XeF; (2) Analysis of vibrational structure in XeCl 3100-A system; (3) Analysis of high-pressure bound-free emission in XeBr, XeI, and KrF.

SUPPORTED BY U.S. Energy Research & Development Admin., Div. of Military Application

4.0017, MICROWAVE AND SUBMILLIMETER LASER INVESTIGATIONS OF MOLECULAR STRUCTURE
R.F. CURL, Rice University, Graduate School, *Houston, Texas* 77001 (CHE76-22367 A01)

Dr. Curl will continue his research in two areas: Microwave spectra and ab initio calculations of boron adducts and submillimeter wave laser studies of HO2 and HCO. In the first area complete structural study of CH3NC---BH3 is proposed. Also Dr. Curl will attempt to prepare and observe the spectra of related BH molecules. Ab initio calculation of HNC---BH3 and HSC---BH3 will be made to gain insight into the feasibility of observing the spectrum of the former molecule. The microwave intensity method will be applied to the determination of relative bond energies of at least one pair of boron adducts.

In the second area, a detailed analysis of the LMR spectrum of HCO and HO2 will be undertaken. Also, two photon (submillimeter laser-microwave) observations of some of the transitions of HO2 and HCO which have been observed by LMR will be attempted. This work is a continuation of that currently supported by Foundation grant MPS-7103046.

SUPPORTED BY U.S. National Science Foundation, Div. of Chemistry

4.0018, ROBUST PARAMETER ESTIMATORS FOR COMMUNICATION DATA
P. PAPANTONIKAZAKO, Rice University, School of Engineering, *Houston, Texas* 77001 (DF046340; AF-AFOSR-3156-77)

AF function - radio multi-access communications, remote sensing, image encoding schemes and radar signature recognition. Deficiency -improvements are needed in the techniques of signal estimation and image processing in the presence of unpredicted interferences and abrupt changes. Objective - develop estimators that are 'robust' in the presence of statistically 'contaminated' communication data. How work contributes - this research will allow for better design of communication systems and signal processing techniques.

A big percentage of the communication channels in the literature have been modeled as gaussian and additive; in the term 'channel' one incorporates all disturbances and measurement errors that are undesirable and which one must get rid of. The main reason for the gaussian and additive assumptions in modeling is analytical simplicity. However, communication channels are often subject to abrupt changes. Therefore, realistically speaking, even when the channel can be modeled successfully as additive, one almost never has a very accurate knowledge of the true un-

derlying distribution. Taking this under consideration together with the fact that the performance of some of the classical parametric tests or estimates for some information retrieval is very unstable under small changes of the underlying distribution, the need for study and design of receivers (or estimators) insensitive to such changes becomes evident. This need has been recognized by statisticians and engineers, and that is how the nonparametric and robust concepts were created. However, although tests with small sensitivity to distribution changes have been proposed and analyzed, the area is far from being exhausted. Indeed, the nonparametric property has been treated separately from the concept of robustness, although they should be connected. The subject of this proposal is the design of estimators that are 'robust' in the presence of statistically 'contaminated' communication data. A radical approach to the concept of robustness is used. A precise detailed definition of statistical contamination is given. Such definition is very sensitive to the distance between probability measures that are used. Robustness is defined as a stability property inside certain contaminated families. Constructive analysis of robustness as defined above leads to methods for designing 'robust' estimators where the concept is not vague any more.

SUPPORTED BY U.S. Dept. of Defense, Air Force

4.0019, EMI/EMP RESISTANT DATA BUS
J.R. BIARD, Spectronics Incorporated, *Richardson*, *Texas* 75080 (DF096150; F33615-74-C-1001)

To design and fabricate a low rate electrooptical data bus exhibiting the ability to tap on or off the bus at selected locations.

This effort will serve as a feasibility model to afford electrooptical data transmission techniques consideration in future airborne data transfer systems.

ADDENDA: Supporting agency address is: AF Avionics Laboratory AAT, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense, Air Force

4.0020, THE AERODYNAMIC DAMPING IN YAWING MOTIONS OF MOTOR VEHICLES AND ITS EFFECTS ON CONTROL AND STABILITY
J.B. RUSSELL, City University, *London*, *England*, *United Kingdom* (087723 (HRB NO.))

Aims: (1) to measure aerodynamic damping in yaw on typical motor vehicle bodies and to compare the results with theoretical estimates and other workers' results on similar bodies; (2) to evaluate the effects on control and stability of this term in the equations of motion. Methods, results and progress: the damping in yaw has been determined over a range of frequencies and Reynolds numbers using 4 car models and two rectangular box models mounted on a fixed ground board in a wind tunnel. The models were free to yaw, being mounted on an air bearing. The damping was determined using the free oscillation technique, yaw angle being measured electronically and recorded on a U.V. recorder. A correlation of the results with geometric properties of the bodies has been found. The car models have positive damping which varies little with frequency. The box models show damping which vary rapidly with frequency from negative values at low frequency to positive at the highest frequencies used. Other stability derivatives have been deduced from the results. Current work is on estimating theoretical values using slender body theory and on determining the effects on control and stability using computer solutions of the equations of motion. /IRRD/IRF/

ADDENDA: Document provided to S.S.I.E. by the H.R.I.S.

SUPPORTED BY City University

GEOSCIENCES

Includes Geosciences (general); Earth Resources; Energy Production and Conversion; Environment Pollution; Geophysics; Meteorology and Climatology; and Oceanography. For Related Information See Also Space Sciences.

5.0001, ANALYSIS OF WAVE-PARTICLE EXPERIMENTS IN THE EARTH'S RADIATION BELT
H.C. KOONS, Aerospace Corporation, *Los Angeles*, *California* 90009 (ATM75-18118 A01)

This grant will support data analysis as part of a continuing effort by the Aerospace Corporation to investigate wave-particle interactions and whistler-mode wave propagation in the magnetosphere.

The approach is to use a high-power, ground-based, VLF transmitter to couple into the magnetosphere whistler-mode waves of known frequency, duration, radiated amplitude, and phase.

The analysis will utilize data collected during the New Zealand International Magnetospheric Study transmission campaign in 1976, funded under NSF Grant ATM75-18118, and the Alaskan campaign in 1973. The data base includes VLF receiver data from Cold Bay, Alaska; Dunedin, New Zealand; Campbell Island; and the ISIS-2 satellite. It also includes ground-based magnetometer data from Dunedin and College, Alaska and energetic electron and proton data from the P72-1 and S3-2 satellites.

SUPPORTED BY U.S. National Science Foundation, Div. of Atmospheric Sciences

5.0002, AREAL SLOPE STABILITY ANALYSIS, SAN FRANCISCO BAY REGION
S. ELLEN, U.S. Dept. of the Interior, Geological Survey, *Menlo Park*, *California* 94025 (9540-01621)

STATE TO WHICH PROJECT PERTAINS: California.

The objective of this project in FY 1977 is to complete research on an experimental method for rapid reconnaissance mapping of slope stability. The method uses differences in the topographic form of hillside terrane as seen in high-altitude aerial photographs to map the landslide processes at work on the slopes. The product exemplifying the approach will be a reconnaissance map at 1:62,500 of slope stability of the Franciscan terrane that makes up most of Marin County, California. Preparation of this map will require completion of detailed mapping of bedrock, surficial mantle and landslide features in four calibration areas, each 2 to 10 km2, located in representative portions of the various topographic units that have been mapped from 1:80,000 aerial photographs. Models of landslide processes will be developed for each topographic unit from the detailed studies, the models to describe the kinds of slides present, their abundance, their habitat within the topography, their activity, rate of movement, timing of movement with respect to rainfall, and appropriate engineering solutions to the hazards posed.

SUPPORTED BY U.S. Dept. of the Interior, Geological Survey, Geologic Div.

5.0003, MESOSCALE ATMOSPHERIC EVENTS - ANTARCTICA
R.J. RENARD, U.S. Navy, Meteorology Department, *Monterey*, *California* 93940 (DPP76-80165)

Meteorological data obtained by satellites, automatic weather stations, and conventional means in the vicinity of McMurdo, Antarctica, during the austral summer period will be analyzed to determine the relationship between mesoscale atmospheric events and synoptic scale circulations. The objective for the first year is to identify the meso-synoptic scale processes relating to operationally significant weather in the McMurdo area. The longer-term goal is to model mesoscale systems associated with significant weather producing synoptic-scale circulations over a permanent ice/snow covered region of variable elevation.

Dr. Renard plans to do field work near McMurdo in austral summer 1977/78 and 1978/79.

SUPPORTED BY U.S. National Science Foundation, Div. of Polar Programs

5.0004, ATMOSPHERIC PROBING USING WAVE PROPAGATION MEASUREMENTS
A.T. WATERMAN, Stanford University, School of Engineering, *Palo Alto*, *California* 94305 (ATM76-23997)

This research involves a program of wind-speed and turbulence measurements using a remote-probing technique which utilizes spatially-filtered incoherent optical waves propagated over a point-to-point, line-of-sight path. To complement previous work

demonstrating resolution in distance along the path, emphasis will be placed on probing a range of scale sizes within the turbulence spectrum. The range of scale sizes chosen is in the region of the viscous cut-off. The device will be used to monitor this region continuously and remotely and to provide in-situ measurements for comparison. Some procedures for varying a spatial filter will be added, so that both the position on the path to which the measurement is sensitive and the scale size to which the measurement is sensitive may be varied continuously.

SUPPORTED BY U.S. National Science Foundation, Div. of Atmospheric Sciences

5.0005, INTERNAL WAVES FROM ERTS
J.R. APEL, U.S. Dept. of Commerce, Environmental Research Labs., *Boulder, Colorado* 80302 (B3331028)

PROJECT OBJECTIVE: Survey ERTS-1 images for internal waves in ocean. Map, analyze, and construct theories for wave generation and behavior. Conduct oceanographic cruise to gather sea truth. Publish results in open literature.

CURRENT YEAR PLAN: Analysis of data from surface-Internal Wave Experiment. Continue image analysis and theoretical investigations. Publish atlas of internal wave activity. Conduct experiment off Eleuthera plus theoretical analysis of wave packets.

PROGRESS REPORT: Three journal publications out.

SUPPORTED BY U.S. Dept. of Defense, Defense Advanced Research Project Agency

5.0006, EQUATORIAL MEASUREMENTS
NICKERSON, U.S. Dept. of Commerce, Environmental Research Labs., *Boulder, Colorado* 80302 (8713 23 77)

PROJECT OBJECTIVES: Conduct a program to measure infrared surface temperatures.

CURRENT YEAR PLAN: Fly on NASA 990 aircraft from Hawaii to American Samoa to carry out infrared measurements program.

SUPPORTED BY U.S. Dept. of Commerce, National Oceanic & Atmospheric Admin., Environmental Research Labs.

5.0007, OKLAHOMA RADAR OPERATIONS
M. SCHERER, U.S. Dept. of Commerce, Environmental Research Labs., *Boulder, Colorado* 80302 (8C370576)

PROJECT OBJECTIVE: Study severe convective storms in the Norman, Oklahoma area.

CURRENT YEAR PLAN: Study dual wavelength parameters using three Doppler radars and analysis of data.

SUPPORTED BY U.S. Dept. of Commerce, National Oceanic & Atmospheric Admin., Environmental Research Labs.

5.0008, DOPPLER LIDAR MEASUREMENT OF POLLUTANTS
R. SCHWIESOW, U.S. Dept. of Commerce, Environmental Research Labs., *Boulder, Colorado* 80302 (BAA7 09 32)

PROJECT OBJECTIVE: Develop and test an operational frequency modulated continuous-wave (FM-CW) Doppler lidar sensor for high resolution measurements of atmospheric processes that transport pollutants.

CURRENT YEAR PLAN: Demonstrate conical scan for profiles. Collect velocity data on atmospheric vortex. Complete free winds profile. Demonstrate FM/CW ranging from hard target.

SUPPORTED BY U.S. Environmental Protection Agency, Office of Research & Development

5.0009, THEORETICAL STUDIES OF PLANETARY ATMOSPHERES
G.E. THOMAS, Univ. of Colorado, Graduate School, *Boulder, Colorado* 80302 (ATM76-23812)

This grant funds a study of the radiative processes which determine the thermal structure of the middle atmospheres of the planets, particularly the stratosphere and mesosphere of Earth. The initial emphasis will be on developing general theoretical methods for calculating the time-dependent properties of temperature and density, as they are affected by changing solar ultraviolet heating, or by impulsive or harmonic disturbances due to dynamical processes. Specific applications will be made to the diurnal temperature variation of the middle atmosphere, to the coupling of photochemistry to radiation, and to the effects of non-LTE on the thermal emission. In addition, this grant funds a study of the structure of the outer hydrogen exosphere of Earth and the planets. This will be achieved both by analysis of satellite measurements and through a dynamical theory of the interaction of the exosphere with solar radiation. It is planned to conduct a detailed study of the behavior of atomic hydrogen in the upper thermosphere during a geomagnetic storm, from an analysis of Lyman alpha airglow data and from a dynamical theory of a time-dependent exosphere.

SUPPORTED BY U.S. National Science Foundation, Div. of Atmospheric Sciences

5.0010, GEOCHEMICAL TECHNIQUES IN URANIUM EXPLORATION
R.A. CADIGAN, U.S. Dept. of the Interior, Geological Survey, *Denver, Colorado* 80225 (9440-01357)

This project will attempt to develop new geochemical techniques using commercially available equipment and where necessary to modify existing equipment, or develop new equipment. Procedures will be designed to detect anomalous chemical, mineralogic, and isotopic indications of uranium mineral deposits where present in rocks, streams, subsurface water, soil, decayed plant material, vegetation, soil gases, and from remotely sensed and LANDSAT spectral imaging. These researching techniques will be integrated with new geophysical techniques and those of other parts of the uranium and thorium resources program.

SUPPORTED BY U.S. Dept. of the Interior, Geological Survey, Geologic Div.

5.0011, GEOMAGNETIC INSTRUMENTATION
R.W. KUBERRY, U.S. Dept. of the Interior, Geological Survey, *Denver, Colorado* 80225 (9780-01529)

STATE TO WHICH PROJECT PERTAINS: Colorado.

A study will be initiated to develop a system for the telemetry of geomagnetic observatory data by means of a satellite relay link.

The USGS observatory automation program will continue with the installation of automated magnetometers at the Fredericksburg, San Juan and Guam Observatories.

SUPPORTED BY U.S. Dept. of the Interior, Geological Survey, Geologic Div.

5.0012, TROPICAL CYCLONES AS REVEALED BY COMPOSITED RADIOSONDE DATA
W.M. GRAY, Colorado State University, School of Engineering, *Fort Collins, Colorado* 80521 (ATM76-23539)

This investigation proposes to examine the three-dimensional structure and dynamics of hurricanes and typhoons from composited radiosonde data. The data are taken from both Atlantic and Pacific Oceans and comprise the effective period of record. The results will permit an examination of the budgets of (1) mass, (2) momentum, (3) kinetic energy, and (4) static energy. It is expected that sufficient data will be available to examine these various budgets as a function of storm age, central pressure, geographical location, time of day, etc. Much additional insight into the structure and dynamical characteristics of tropical cyclones should be forthcoming.

SUPPORTED BY U.S. National Science Foundation, Div. of Atmospheric Sciences

5.0013, USE OF METEOROLOGICAL SATELLITE DATA IN THE TROPICS
T.H. VONDERHAAR, Colorado State University, School of Science, *Fort Collins, Colorado* 80521 (ATM76-82697)

The objectives of this research continue to be: (1) the determination of the energetics of the tropical earth atmosphere system, (2) the study of radiational properties of tropical clouds, and (3) the study of organized tropical oceanic convection.

The data to be used to achieve these objectives are from four satellites: the Nimbus-5, SMS-1, NOAA-3 and the METEOR. These data will be analyzed for the Global Atmospheric Research Program (GARP) Atlantic Tropical Experiment (GATE) region in the eastern tropical Atlantic.

The scientific goal of the first objective is to obtain the most complete and accurate data set of the radiation/energy budget that has ever been obtained over tropical regions. This set will serve as a basic GATE data set available to others in the meteorological community. The second objective addresses the problem of classifying the bi-directional reflectance of tropical clouds as a function of sun-cloud geometry, size, and cloud top temperature. This approach has useful application for monitoring geosynchrous satellite measurements for regional heat budgets. The third objective has as its goal the determination of the initiation, growth, and maintenance of tropical convective systems.

SUPPORTED BY U.S. National Science Foundation, Div. of Atmospheric Sciences

5.0014, RAPID ANALYSIS OF RARE AND/OR UNUSUAL CHONDRITES AND COMPILATION OF COMPUTER FILE FOR ALL CHONDRITES

K. FREDRIKSSON, Smithsonian Institution, *Washington, District of Columbia* 20560 (SRF 71702104)

We propose to complete a computer listing of all chondrites including classifications and basic mineralogic and chemical data. Location of reasonable available research material will be listed with references for each chondrite. The file can be searched and the computer programmed to check for correlations, e.g., between the classifications and/or gas rich or 'unequilibrated' samples. Data already available, e.g., petrographic grade and 'old' and 'new' classification as well as 'Museum Location' and 'Value', will be recorded for incorporation in the master file at the Max-Planck Inst. (Abt. Kosmochemie), Mainz. Additional data on phase composition and in selected cases bulk analyses using a newly developed rapid technique will be submitted periodically for updating. In a future development we anticipate to store complete analytical data. This work should greatly facilitate supplying suitable and well-documented samples to other researchers and at the same time avoid waste of unreplaceable material by duplicate donations or investigations.

SUPPORTED BY Smithsonian Institution, Smithsonian Research Foundation

5.0015, ATMOSPHERIC RADIATIVE TRANSFER AND ATOMIC PROCESSES

A.E. GREEN, State University of Fla. Sys., Interdisc. Center for Aeronomy, *Gainesville, Florida* 32611 (ATM75-21962 A02)

This grant will fund research into a variety of problems. These include: 1. Theoretical atmospheric radiative transfer calculations. These calculations deal with multiple scattering processes in a variety of environments including a partially obscured sky. 2. Experimental atmospheric radiative transfer measurements. These measurements will be used to check the validity and accuracy of the radiative transfer calculations. Few measurements of this type have been made in the past. These relatively simple measurements should enhance our knowledge of the intensity of ultraviolet radiation in the lower atmosphere. 3. Atomic calculations for aeronautical applications. This work will continue the calculation and the 'cataloging' of electron collision cross sections of aeronomic interest.

SUPPORTED BY U.S. National Science Foundation, Div. of Atmospheric Sciences

5.0016, UTILIZATION OF A DUAL-WAVELENGTH RADAR IN METEOROLOGICAL STUDIES

E.A. MUELLER, Univ. of Illinois, State Water Survey Division, *Urbana, Illinois* 61802 (ATM75-14221 A02)

This will continue support for the use of the Chicago, Illinois, CHILL radar system in several field experiments and the subsequent analysis of the data. This portable, dual-wavelength radar system complete with Doppler capability and sophisticated signal processing is capable of addressing a wide range of atmospheric questions in different climatic areas. Operations currently underway or planned for this effort are: January 1976 - March 1976 - Operations in northeastern Illinois will focus on studies of lake storms and winter storms. The CHILL system will be operated in conjunction with an NCAR 5-cm Doppler radar and the University of Chicago Doppler radar. April 1976 - June 1976 - The CHILL system will be moved to a site which has been prepared at Anadarko, Oklahoma. This site will permit a triple Doppler radar experiment (using two NOAA Dopplers). The research will be primarily directed toward study of the dynamics of severe storms in cooperation with the Universities of Oklahoma and Wyoming. June 1976 - March 1977 The radar will be used for precipitation measurements in the Chicago metropolitan area and in southern Illinois in a cooperative effort with the University of Chicago cloud physics airplane. April 1977 - May 1977 - Further joint research with the National Severe-Storms Laboratory continuing the severe-storm research begun in 1976 in Oklahoma.

SUPPORTED BY U.S. National Science Foundation, Div. of Atmospheric Sciences

5.0017, IONOSPHERIC WAVES

K.C. YEH, Univ. of Illinois, School of Engineering, *Urbana, Illinois* 61801 (ATM74-08765)

This grant funds a renewal of NSF Grant GA-42857, for a continuation of Drs. K. C. Yeh and C. H. Liu's experimental and theoretical studies of ionospheric gravity waves. In particular, it funds: 1. continued experimental investigation of ionospheric gravity waves with the National Astronomy and Ionosphere Center's incoherent scatter radar at Arecibo, Puerto Rico. Wave parameters and atmospheric loss mechanisms are areas of particular interest. 2. Continued experimental and theoretical studies of the coupling between the lower and upper atmospheres through gravity waves. 3. A study to try to locate and identify natural sources of gravity waves. From earlier studies, it appears that a variety of natural phenomena (thunderstorms, jet stream shear and divergence, etc.) can generate atmospheric gravity wave. 4. An investigation of a possible resonance in the equatorial ionosphere, occurring when the natural drift of ionization and the phase velocity of a gravity wave propagating through the region coincide.

SUPPORTED BY U.S. National Science Foundation, Div. of Atmospheric Sciences

5.0018, ESTIMATED WINTER WHEAT YIELD FROM CROP GROWTH PREDICTED BY LANDSAT

E.T. KANEMASU, Kansas State University, Agric. Experiment Station, *Manhattan, Kansas* 66502 (0070390; KAN-05-483)

OBJECTIVE: Evaluate an evapotranspiration model and growth equations for winter wheat in Kansas.

APPROACH: Leaf area index will be predicted from Landsat data. The evapotranspiration model will use LAI, solar radiation and temperature. Winter wheat growth will be estimated from growth equations derived from photosynthetic chamber data.

SUPPORTED BY Kansas State Government

5.0019, FOREST DAMAGE ASSESSMENT USING REMOTE SENSING

M.D. ASHLEY, Univ. of Maine, Agric. Experiment Station, *Orono, Maine* 04473 (0065683; ME09607)

OBJECTIVE: Aerial photography, multispectral scanner and image enhancement remote sensing systems will be evaluated to find if it is possible through the use of these remote sensors to: Detect areas of new budworm attack earlier than with present methods; Identify forests requiring spraying or other control measures to prevent excessive tree mortality and timber loss from budworm attack more efficiently than with present methodology; Assess the degree of recovery of forest stands after spraying; Determine the location and amount of mortality caused by the spruce budworm.

APPROACH: Data collected from field and laboratory studies of remote sensing imagery will be evaluated to find how well budworm damage can be assessed using such imagery. Different film-types, scales of photography and the multispectral scanner imagery will be obtained in mid-summer (maximum browning), late fall and early winter. The aerial photography and field work will be initiated in July 1974 in the spruce-fir region of northern Maine. Further photographic and the multispectral studies will be undertaken in 1975 in western and eastern Maine if other funding can be obtained. The duration of the study will be three years with field work and preliminary analysis being carried out over the first two years with final evaluations and conclusions being made and released during the third year.

PROGRESS: Work this year has included analysis of summer and fall, color and color infrared aerial photography of sprayed and unsprayed budworm infested areas. This analysis indicates that damage assessment can be more accurately made using color infrared film. It has also been found that individual mortality trees can be located at photographic scales down to two inches per mile. The illustrations for a ground photographic guide to interpretation for damage assessment by field personnel have been assembled. The guide will be published soon. Work has also been initiated on the utility of color infrared film in assessing the efficiency of experimental chemical and biological controls. The results of this research will be reported upon when the analysis is completed. Study of multispectral photography and satellite multispectral scanner imagery will be initiated soon to find the usefulness of these remote sensors in evaluating budworm damage.

SUPPORTED BY U.S. Dept. of Agriculture, Cooperative State Res. Service, Maine

5.0020, ATMOSPHERIC LIDAR RESEARCH
T.D. WILKERSON, Univ. of Maryland, Inst. for Fluid Dyn. & Math., *College Park, Maryland* 20742 (NSG 5174)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Organization & Management Office, Office of University Affairs

5.0021, EQUATORIAL IONOSPHERIC IRREGULARITIES MEASUREMENTS
R.S. NARCISI, U.S. Air Force, Geophysics Laboratory, *Bedford, Massachusetts* 01730 (DF249350)

AF function - maintain command control capabilities for Air Force operations in naturally or nuclearly disturbed conditions. Opportunity - the wideband satellite permits propagation measurements during periods of equatorial scintillations. Objective - measure the distribution of ion species during periods of equatorial scintillations to determine the structure and development of small scale ionospheric irregularities. How research contributes - this effort will provide the first detailed measurements of ionospheric irregularities in conjunction with wideband satellite amplitude and phase measurements. From this, the physical causes of scintillations can be understood to then permit the determination of trans-ionospheric electromagnetic channels for defense communication and navigation systems.

Three positive ion mass spectrometers will be designed and fabricated into three multi-instrumented rocket payloads. These payloads will be integrated into a combined ground and rocket equatorial measurement series conducted with the wideband satellite. The mass spectrometer instruments will measure positive ion composition. These measurements (and other coordinated experiments) will be made during periods of equatorial scintillations and overflight of the satellite. These composition measurements will show, for the first time, the species whose variations are responsible for the equatorial ionospheric scintillations.

ADDENDA: Supporting agency address is: AF Geophysics Laboratory, LK Hanscom AFB, Bedford, Mass 01730

SUPPORTED BY U.S. Dept. of Defense, Air Force

5.0022, SATELLITE STUDIES OF LOW-ENERGY IONS AND ELECTRONS
R.C. SAGALYN, U.S. Air Force, Geophysics Laboratory, *Bedford, Massachusetts* 01730 (DF248930)

AF function - surveillance, communication, navigation, ionosphere and magnetosphere modeling. Deficiency - because little is known of electron density distributions in the topside ionosphere, large uncertainties exist in technical determinations required for prediction programs. Ionosphere small scale irregularities cause amplitude and phase changes of hf and uhf transmissions. Objective - the development, test and calibration of the SSIE instruments to be flown on the DMSP block 5d satellites will be completed. Studies of low- and mid-latitude small scale irregularities will be intensified. How research contributes - the results of the DMSP SSIE sensor will be used to update AWS ionosphere prediction programs. Knowledge of the power spectra and morphology of ionosphere small scale irregularities will aid in the design and operation of uhf communication and navigation systems.

Plasma instruments are designed for satellite flight. Results from ISIS-I, INJUN V and S3-2 satellites will be analyzed to study ionospheric irregularities.

ADDENDA: Supporting agency address is: AF Geophysics Laboratory PH, Hanscom AFB, Bedford, Mass 01730

SUPPORTED BY U.S. Dept. of Defense, Air Force

5.0023, LOW-ENERGY PLASMA INSTRUMENT
R.C. SAGALYN, U.S. Air Force, Geophysics Laboratory, *Bedford, Massachusetts* 01730 (DF249210)

AF function - surveillance, communication, navigation, magnetospheric modelling and spacecraft charging. Deficiency -inadequate knowledge of the electrical properties of the magnetosphere and of the interaction of a satellite with the environmental plasma at synchronous altitudes. Objective - to design and fabricate instruments to measure the low-energy plasma (0 to 100 ev) environment of a synchronous orbit satellite to determine the role of low-energy particles in spacecraft charging. How research contributes - permits improved military space vehicle design for communication and surveillance systems, provides understanding of dynamical processes in the magnetosphere and contributes to the understanding and solution of spacecraft charging problems.

Low-energy plasma sensors will be flown on the spacecraft charging (SCATHA) P78-2 satellite. The sensors will measure and distinguish the major sources of low-energy particles contributing to the current flow to the spacecraft. In addition, the local spacecraft surface potential with respect to the plasma will be determined.

ADDENDA: Supporting agency address is: AF Geophysics Laboratory PH, Hanscom AFB, Bedford, Mass 01730

SUPPORTED BY U.S. Dept. of Defense, Air Force

5.0024, EFFECT OF BEAM-PLASMA INTERACTIONS IN HIGH-LATITUDE IONOSPHERE
E.G. FONTHEIM, Univ. of Michigan, School of Engineering, *Ann Arbor, Michigan* 48106 (ATM73-00322 A02)

It has recently become apparent that some phenomena occur in the atmosphere which are not well explained by existing theories, probably because the theories contain over-simplifications. One particular example of current interest is the existence of electric fields in the Earth's ionosphere when the conventional wisdom says that when the electrical resistivity along a field line is too low for such a field to exist, it should be 'shorted out'. The problem theorists face is how to explain the 'anomalous resistivity' that appears to exist in such situations. This grant supports theoretical research to examine the two principal contenders for the solution to this question: the collision-free current-driven instability of Kindel and Kennel (1971) and the electron-beam-driven instability of Papadopoulos and Coffey (1974). Calculated ion and electron temperature profiles will be compared to incoherent scatter data and to satellite data. Also, collisions will be included in the two theories so that both can be extended to lower altitudes.

SUPPORTED BY U.S. National Science Foundation, Div. of Atmospheric Sciences

5.0025, RADAR BACKSCATTER STUDIES OF THE IONOSPHERE
A.E. NAGY, Univ. of Michigan, School of Engineering, *Ann Arbor, Michigan* 48106 (ATM75-03986 A01)

This grant funds a theoretical and incoherent scatter radar data analysis study of the atmosphere and ionosphere. In particular, it funds: 1. the development of a comprehensive numerical model of the chemistry, transport and energetics of the ionosphere and plasmasphere and comparison of the theoretical calculations with data obtained by the Arecibo backscatter facility and the Atmosphere Explorer satellites; 2. a study of the diurnal and seasonal variability of the thermospheric neutral hydrogen density as deduced from radar backscatter information; 3. a comparison between calculated and measured photoelectron escape fluxes; and 4. calculation of the radar backscatter spectra due to non-Maxwellian ion velocity distributions and an investigation of the degree to which past data interpretation schemes may have been influenced by such effects.

SUPPORTED BY U.S. National Science Foundation, Div. of Atmospheric Sciences

5.0026, AIR PHOTO ANALYSIS OF PLANT SUCCESSION
C.E. OLSON, Univ. of Michigan, School of Natural Resources, *Ann Arbor, Michigan* 48104 (0067795; MICY00041-F)

OBJECTIVE: Determine the accuracy of air photo detection of ecotonal change in natural vegetation systems, and identify the parameters affecting accuracy.

APPROACH: Analyze sequential aerial photography over a 35 year period and compare type mapping results with historical records from ground surveys.

PROGRESS: Sequential aerial photography of four areas in Washtenaw County, Michigan, has been selected for study to determine the extent to which prior work done in Livingston County, Michigan, can be extrapolated to other areas.

SUPPORTED BY Michigan State Government

5.0027, AIR PHOTO ASSESSMENT OF TREE SURVIVAL FOLLOWING FLOODING
C.E. OLSON, Univ. of Michigan, School of Natural Resources, *Ann Arbor, Michigan* 48104 (0067811; MICY00087-F)

OBJECTIVE: Determine the number of living trees in five flooded populations of mixed bottomland species from air photos. Relate survival to water depths and flooding history.

APPROACH: Tree counts made from 1:8000 scale air photos taken six years after initial impoundment of Lake Oklawoka, Fla. Data compared with earlier ground data and field investigation one month after date of photography.

PROGRESS: Work on this project has been delayed by the lack of additional aerial photography of the study area. Resumed activity is expected in 1976.

SUPPORTED BY Michigan State Government

5.0028, USE OF REMOTE SENSING FOR LAND USE POLICY FORMULATION
R.D. VLASIN, Michigan State University, Agric. Experiment Station, *East Lansing, Michigan* 48823 (0064769; MICL01168)

OBJECTIVE: To demonstrate the operational ability and uses of remote sensing for land use planning and policy formulation. Specifically to: develop, apply, and evaluate a system which will incorporate remote sensing for classifying land use and resource characteristics; apply remote sensing to program needs of selected Michigan agencies; apply the findings of the research to the land use policy formulation process in Michigan.

APPROACH: Actual sites selected with governmental units to test usefulness of various RS applications. 'Short-term' direct agency applications to permit development, completion, evaluation, and approaches. Applications also to longer-run policy efforts. Departments of Crop & Soil Sciences, Forestry, Resource Development, Urban Planning & Landscape Architecture, and Geography involved.

PROGRESS: During 1975, remote sensing has been used to derive data required for effective land/resource use decisions and actions by agencies in Michigan. Project efforts have facilitated the implementation of land use programs by several county agencies. Antrim Co. now uses aerial photos to evaluate site plans required for earth change activities under the Michigan Soil Erosion and Sedimentation Control Act. An aerial inventory of current land uses in Wayne Co. assisted in identifying lands to be reserved under the Michigan Farmland and Open Space Preservation Act. The Charlevoix Equalization Dept. now uses imagery to more accurately reassess land values. An aerial inventory of abandoned vehicles in Antrim Co. facilitated a countywide cleanup. The distribution of agricultural lands in Gratiot Co. was identified from aerial photos to provide a data base for corporate decisions aimed at optimizing the location of future crop processing facilities. The Project has underway additional applications of remote sensing including: an assessment of the recreational potential of backcountry rivers; identification of selected physical features for a development study of the Detroit riverfront; determination of intensity and extent of crop damage for insurance purposes; identification of stressed trees and mosquito breeding areas; the use of LANDSAT data for locating agri-business plants; and research on comparative information systems for use of remote sensing in natural resource management.

SUPPORTED BY U.S. Dept. of Agriculture, Cooperative State Research Service, Michigan

5.0029, SNOW DEPTH - WATER EQUIVALENT AND COMPARABLE ROOF LOADING
T.L. HANSON, Montana State University, Agric. Experiment Station, *Bozeman, Montana* 59715 (0064513; MONB00114)

OBJECTIVE: Feasibility of using natural radiation for measuring snow water equivalent using airborne sensing equipment. Obtain data for correlation between snow accumulation on the ground and that which can be expected on roofs.

APPROACH: Select a site with past data on snow water equivalent to establish attenuation of natural radiation. If necessary, enhance background radiation with naturally occurring materials. Make flights throughout the snow season to obtain snow water equivalent data which can be checked against data obtained by Soil Conservation Service. A low-cost building will be constructed in the immediate vicinity of the area to be used for airborne measurement of snow accumulation on the ground and measurement of snow load on the roof will be made throughout the winter season.

PROGRESS: Eight additional flights were made during the winter and spring months. The apparent maximum measurable snow-water equivalent for the euxinite and natural background is 19 in. Snow drifts created problem in late January and February. Also, a quick melt-out in the spring thwarted efforts to obtain a curve during the melt-out period. The data appears to be in line with on-site snow tube measurements up to the limit of the source. Laboratory tests will be used to verify the 19 in. water limitations of the sand, altitude effect and any effect of changing the amount of sand. During the winter and spring of 1974, roof snow loads could only be estimated, since all of the weighing equipment had not been installed. The necessary hydraulic measuring equipment was installed during the summer. From all indications during the first winter of the project, it appeared that roof loads were somewhat less than those which would be calculated using standard design procedures. Two visits were made to the site during late 1974. At those times, the ratios of snow on the roof to that on the ground was 0.339 for the first visit and 0.204 for the second. These are quite a bit below the ASAE recommended design value of 0.581.

SUPPORTED BY U.S. Dept. of Agriculture, Cooperative State Research Service, Montana

5.0030, GRAZING SYSTEMS AND RANGE IMPROVEMENT EFFECTS ON SOIL WATER AND ANIMAL PRODUCTION FROM RANGELAND
D.E. RYERSON, Montana State University, Agric. Experiment Station, *Bozeman, Montana* 59715 (0068506; MONB00191)

OBJECTIVE: Determine the role of grazing systems and incorporation of other range improvement treatments on: Fate of water in the soil profile (retention storage, detention storage, and quality and estimated quantity of potential detention storage water release as related to saline seep potential). Livestock responses and related economics; wildlife and recreational values.

APPROACH: Utilize established or establish large size range units with continuous season long grazing, rest rotation grazing, rotational deferred grazing systems and with other range improvement practices or initiate these in cooperation with private operators, grazing districts and Federal agencies for conducting the research monitoring activities to determine fate of water in the soil profile in response to these practices, effects on water quality and quantity by deep well monitoring, vegetational responses by cover and productivity changes utilizing remote sensing techniques where possible; monitor grazing animal responses (gain, reproductive performance, etc.). Determine economic values; note wildlife use and recreational use of the areas.

SUPPORTED BY U.S. Dept. of Agriculture, Cooperative State Research Service, Montana

5.0031, SEASONAL MOVEMENTS OF THE BURDETTE CREEK ELK HERD

H.M. ZAHN, Univ. of Montana, School of Forestry, *Missoula, Montana* 59801 (0065995; MONZ-C01)

OBJECTIVE: Determine seasonal movements of elk from the Burdette Creek forested winter range. Determine movements in relation to logging and roads in nearby drainages.

APPROACH: Radio tagged elk are followed by air and ground. Locations mapped and movements analyzed with respect to forest land use.

SUPPORTED BY Montana State Government

5.0032, CLASSIFICATION AND ECOLOGY OF PINYON-JUNIPER WOODLANDS AND ASSOCIATED SHRUBS IN NEVADA

P. TUELLER, Univ. of Nevada System, Agric. Experiment Station, *Reno, Nevada* 89507 (0071781; NEV00693)

OBJECTIVE: Develop basic synecological understanding of Great Basin pinyon-juniper woodland in relation to the environment. Define successional patterns in major subdivisions. Identify ecotypes of shrubs associated with particular habitat types. Relate management problems to habitat types.

APPROACH: Field reconnaissance and detailed macroplot analysis will be conducted to identify habitat types. Reconnaissance work will be aided by multiscale imagery from conventional aircraft and satellites. Selected stands within homogeneous units will be sampled in detail as to soil profile, land form, age class distribution and associated vegetation. Suitable keys will be developed to aid classification once the important relationships are defined.

SUPPORTED BY Nevada State Government

5.0033, MEASUREMENT OF THE NEUTRON AND GAMMA-RAY FLUX IN THE ATMOSPHERE

J.A. LOCKWOOD, Univ. of New Hampshire, School of Liberal Arts, *Durham, New Hampshire* 03824 (ATM76-12258)

This grant will permit University of New Hampshire (UNH) investigators to calibrate and fly on a balloon flight a neutron (n) and gamma-ray (gamma) detector capable of measuring the fluxes, energy spectra and angular distributions in the energy intervals from 3-75 Million electron Volts (MeV) and 1-15 MeV, respectively. The UNH n-gamma detector consists of two banks of six liquid scintillators, each 7.5 cm by 7.5 cm in size. The two banks are separated. A pulse shape discriminator (PSD) is included on each liquid scintillator to discriminate between neutrons and gamma-rays. The TOF system will enable the directions of the incident gamma-rays and neutrons to be determined for either upward or downward-moving neutral particles. The two detector banks are separately enclosed in anti-coincidence charged-particle shields. The detector design represents an optimum compromise between unique particle identification and total collecting area (i.e., maximum counting rate).

This n-gamma detector was built and test flown in 1975 under a previous NSF grant (GA-33858). Some modifications are planned in the electronics system before calibration and the next flight. Preliminary analyses of the data from the 1975 flight indicate that it was successful and that the incorporation of PSD with TOF in a directional neutron and gamma-ray telescope is important.

This work has three major objectives, namely, to (1) measure the neutron flux escaping from the atmosphere in order to test the assumption that this is an important contribution to the source of the Van Allen radiation belts; (2) measure the fluxes of neutrons and gamma rays in the atmosphere; (3) measure the background gamma-ray fluxes in order to further refine the measurements of cosmic gamma-rays.

SUPPORTED BY U.S. National Science Foundation, Div. of Atmospheric Sciences

5.0034, FORMATIONAL PROCESSES OF FRAZIL ICE

G. FRANKENSTEIN, U.S. Army, Cold Reg. Res. & Engin. Lab., *Hanover, New Hampshire* 03755 (31350)

OBJECTIVE: To predict quantitatively the amount of frazil ice produced under specified wintertime weather and hydraulic conditions.

APPROACH: To develop instrumentation suitable for field use which measures frazil concentration in situ, and to relate these concentrations to the causative climatic and hydraulic parameters.

STATUS: Field trips were made to sites in Alberta, Ontario and Quebec, Canada, to sites in the international rapids area of the St. Lawrence, and locally. Data were obtained concerning the formational and accumulation characteristics of frazil ice. Some field sampling and measurement techniques were developed to obtain density, porosity, bond strength and permeability of accumulated frazil.

Under other funding, the radar profiler was evaluated in the field for the detection and quantification of underhanging frazil. The device has limitations, but performed well when the frazil was reasonably homogeneous and firm (i.e., not significantly degraded about the edges by warm water). Surface and airborne operations were accomplished.

The small flume was completed. Initial tests indicate that better insulation of the recirculation portion is required.

SUPPORTED BY U.S. Dept. of Defense, Army, Corps of Engineers

5.0035, SOIL PERMEABILITY, SNOW COVER AND RUNOFF RELATIONSHIPS

L. GATTO, U.S. Army, Cold Reg. Res. & Engin. Lab., *Hanover, New Hampshire* 03755 (31250)

OBJECTIVES: To determine the feasibility of providing an index of flood probability and intensity on a synoptic scale using remote sensing techniques.

APPROACH: The fundamental information required for snow melt flood forecasting both on a short and long term basis is an accurate knowledge of the areal extent, temperature and total water equivalent of the snow cover, soil moisture conditions at freeze-up and thaw and the extent of frozen ground. Acquisition of these data by conventional methods is seldom possible; and in the rare instances in which attempts are made to obtain them, the effort is usually very costly and time consuming. Advances in remote sensing techniques, particularly satellite sensors, may provide methods to rapidly evaluate and monitor these parameters on a regional scale.

LANDSAT 1 and 2 Multispectral Scanner (MSS) imagery will be obtained sequentially over the Heart River basin, North Dakota, from fall freeze-up to spring thaw throughout the experimental period. This imagery and established manual techniques will be used to monitor the areal extent of snow cover. The data derived from these techniques will be correlated with snow cover data acquired by the National Weather Service. Previous laboratory investigations have shown that soil moisture conditions and the extent of frozen soil can also be inferred from albedo changes that occur during freezing and that are apparent in wavelength equivalent to those of the LANDSAT MSS. Conventional manual techniques using LANDSAT imagery and automatic computer techniques developed at the Goddard Institute for Space Studies (GISS) using LANDSAT digital data will be investigated as methods for differentiating soil moisture status by these reflectance changes. The data acquired will be compared to ground truth data (soil temperature and moisture content) acquired by the Agricultural Research Service, Mandan, North Dakota. In addition, an airborne spectroradiometer developed at

the GISS will be used in an attempt to detect albedo changes that occur between frozen/unfrozen and saturated/unsaturated soils and to differentiate ripe from fresh snow cover. This spectroradiometer senses reflected light in 500 channels between approximately .43 to 1.0 micron and provides better spectral and spatial resolution than the LANDSAT 1 and scanners. (Text Abridged)

SUPPORTED BY U.S. Dept. of Defense, Army, Corps of Engineers

5.0036, AEROSOLS OF THE POLAR REGIONS
A.W. HOGAN, State University of New York, Atmospheric Sciences Res. Ctr., *Albany, New York* 12203 (DPP76-23110)

During the austral summers of 1977/78 and 1978/79 and the austral winter of 1978, measurements will be made at South Pole station of aerosol concentrations, ozone, carbon dioxide, and other trace chemical constituents at the surface of the ice cap and up to the katabatic return flow above the inversion. The above-surface measurements will be made using tethered balloons. In addition, measurements of aerosols, ozone, and meteorological parameters will be made in the troposphere between McMurdo and Pole using the science instrumented C-130 logistics aircraft. These measurements will be used to map tropospheric air trajectories between McMurdo and South Pole, and in conjunction with the ground-based and balloon-borne sampling data, to (1) determine the capture rate of aerosol particles by the ice cap, (2) determine what the aerosol sink mechanisms are and their relative strengths, (3) determine the size and composition of the aerosols scavenged by ice crystal precipitation, (4) determine the destruction rate of ozone over ice at various temperatures, and (5) determine the aerosol concentrations above strong inversions.

SUPPORTED BY U.S. National Science Foundation, Div. of Polar Programs

5.0037, FOG PREDICTION MODEL
G.G. LALA, State University of New York, Graduate School, *Albany, New York* 12203 (ATM76-24048)

A program of computer modeling and field measurement is proposed to investigate radiation fogs. An existing computer model for fog prediction would be further refined to include the time dependence of the exchange coefficient, absorption and scattering of long wave radiation by fog droplets, and the influence of soil moisture. These additions are necessary to improve the accuracy of the forecast model; realistically characterize radiation fogs and their evolution; and increase the usefulness of the model for fog prediction in other locations. The major emphasis of this study is the prediction of the occurrence and intensity of radiation fogs for various areas of the northeastern United States where radiation fogs occur.

Selected fog field measurements are necessary for input to the model, as well as for verification of model prediction. Such information would also add to the rather meager data base for fog microphysics variables.

SUPPORTED BY U.S. National Science Foundation, Div. of Atmospheric Sciences

5.0038, PHENOLOGY, WEATHER, AND CROP YIELDS
B.E. DETHIER, Cornell University, Agric. Experiment Station, *Ithaca, New York* 14850 (0069610; NYC-125426)

OBJECTIVE: Use phenological and mesoscale weather data to understand yield dynamics and improve prediction of yield of selected agricultural crops.

APPROACH: The phenoclimatic models will be developed using mesoscale weather data (supplied by NOAA), phenological data (supplied by NASA). These will be tested against actual yield data and compared with existing solar thermal unit, various growing degree day, the Newman-Purdue and Brown-Ontario models. Remotely sensed data from aircraft and satellite will be studied to determine their usefulness in providing environmental input to crop condition and yield, as an indicator to phenophases of natural vegetation (forest and rangeland) and selected agricultural crops (wheat, corn, alfalfa, soybean, and some grasses) and as a means of quickly determining crop acreage.

SUPPORTED BY U.S. Dept. of Agriculture, Cooperative State Research Service, New York

5.0039, APPLICATION OF LUNR SYSTEM TO FLOOD PLAIN ANALYSIS AND MANAGEMENT IN THE SUSQUEHANNA RIVER BASIN
J.W. KELLEY, Cornell University, Agric. Experiment Station, *Ithaca, New York* 14850 (0063451; NYC-147313)

OBJECTIVE: Develop a procedure for utilizing technical aspects of New York State Land Use and Natural Resources (LUNR) system more effectively in water resources planning and more specifically in terms of flood plain management in the Susquehanna River Basin.

APPROACH: The Elmira-Horseheads New York region will be the study area. The research will include manipulation of actual LUNR inventory data, identification of decisions and display procedures. Emphasis will be placed on flood plain identification and characterization via remote sensing, data use for water planning needs and an evaluation of feasibility of developing an improved LUNR system for the Susquehanna River Basin.

PROGRESS: Research has been completed and a preliminary report has been prepared which discusses the characteristics of the LUNR system and feasibility of application to the Susquehanna River Basin, including an overview of the LUNR system; LUNR chronology; technical and cartographic considerations; classification of inventory items; computer aspects of LUNR process; innovations; expenditure estimates and user services and examples of LUNR applications to the Susquehanna River Basin including watershed management; land use monitoring, scale analysis; pollution identification and surveillance; environmental impact statements and other potential uses of LUNR. Preparation of final report is well under way with an anticipated completion date on or before 15 February 1974.

SUPPORTED BY New York State Government

5.0040, MONITORING STREAM SEDIMENT LOADS THROUGH MULTISPECTRAL AERIAL PHOTOGRAPHY
T.M. LILLISAND, State University of New York, Graduate School, *Syracuse, New York* 13210 (0066319; NYZ-107-0-008)

OBJECTIVE: To develop a multispectral photographic remote sensing system to facilitate measurement of sediment production in forested areas.

APPROACH: Simultaneous acquisition of multiple exposure aerial photographs, in situ reflectance measurements and suspended solids samples will be made. Photographs will be procured with a 4-camera bank of motor-driven 70 mm Hasselblad cameras. Microdensitometric measurements at image point positions associated with each ground sampling point will be extracted from the photography. Models will be developed enabling estimations of sediment concentrations from image density observations. Concentration maps will be generated using electronic image analysis equipment.

SUPPORTED BY U.S. Dept. of Agriculture, Cooperative State Research Service, New York

5.0041, MULTISPECTRAL PHOTOGRAPHIC REMOTE SENSING SYSTEM TO EXPEDITE DETECTION OF TREE STRESS IN URBAN ENVIRONMENT
T.M. LILLISAND, State University of New York, Graduate School, *Syracuse, New York* 13210 (0066320; NYZ-113-0-003)

OBJECTIVE: Quantify changes in the photometric and geometric properties of selected species in response to stress mechanisms typical of urban environments; develop and test a photographic remote sensing data acquisition and analysis system which would permit expeditious detection of stress for the species/stress mechanisms studied above; delineate mechanisms by which the above detection system might be integrated into the urban tree cover inventory and maintenance process on a regional basis.

APPROACH: Laboratory investigation of the photometric and geometric response of trees to controlled sources of stress will be used to design an aerial photographic stress detection system. Photographic effects (film processing, atmospheric attenuation, etc.) precluding remote stress detection will be

negated through sensitometric film control and analysis. Close range photogrammetry, laboratory spectroradiometry, multispectral aerial photography and semi-automated electronic image analysis will be employed.

SUPPORTED BY U.S. Dept. of Agriculture, Cooperative State Research Service, New York

5.0042, PROJECT DAVINCI II - DATA ANALYSIS AND INTERPRETATION

C.E. DECKER, Res. Triangle Institute, *Durham, North Carolina* 27709 (68-02-2568)

The objectives of this project are to consolidate data collected as part of Project DaVinci II and to analyze and interpret these data for the broad purpose of relating emissions upwind, within, and downwind of St. Louis to observe ambient levels of primary and secondary pollutants upwind, within and downwind of St. Louis. Information will be presented in such a way to permit EPA to further develop and apply methodologies for evaluating the effectiveness of existing or proposed control strategies for meeting ambient air quality standards.

The approach that will be used to analyze and interpret the DaVinci II data will synthesize data collected in two frameworks, i.e., surface and upper air meteorological data were taken from an Eulerian system, while DaVinci II balloon measurements were taken in a nearly Lagrangian system. Meteorological characteristics of the balloon environment will be related to the chemical and oxidant concentrations measured aboard the DaVinci II balloon and to measurements from other platforms--aircraft, RTI mobile van, and ground stations.

Subject areas relative to the analysis and interpretation of the DaVinci II data from a chemical and meteorological standpoint include hydrocarbon analyses, atmospheric chemistry processes, plume identification techniques, boundary layer analysis, cross-section analysis, and modeling. The final report will combine each facet into cohesive analysis that should provide better insight into the behavior, transport, synthesis, and destruction of zone and precursors in the vicinity and in a plume downwind of St. Louis.

SUPPORTED BY U.S. Environmental Protection Agency, Office of Research & Development

5.0043, LAND USE ANALYSIS FOR OUTDOOR RECREATION BY REMOTE SENSING

K.A. WENNER, Ohio State University, School of Agric. & Home Econ., *Columbus, Ohio* 43210 (0066865; OHO00456-S)

OBJECTIVE: Analyze computer processed Remote Sensing Data compiled from the Earth Resources Technology Satellite. The analysis evaluations, and conclusions will be utilized to make recommendations for a method of continually and rapidly updating the land use data in potential recreation areas and to redefine the area delineations.

APPROACH: A computer print-out map of machine processed ERTS data showing up to 12 basic land uses of Geauga County, Ohio, will be purchased from LARS, Purdue University. Ground truth data of previously designated potential recreation areas will be obtained by visual inspection and compared to the machine processed data.

PROGRESS: Data on agricultural, forestry, water and urban land use acreage for 6,560 acre test area in Geauga County, Ohio, were obtained from aerial photo interpretation and on-site inspection, and compared with data from machine processed multispectral scanner data collected by ERTS to determine if ERTS data are sufficiently accurate to permit delineation of potential outdoor recreation resources areas (RRA). Criteria were established to quantitatively define and evaluate current land use for RRA. The test site was divided into 160 acre units for gross analysis and into 1.6 acres for detailed analysis. ERTS was 80% accurate for gross analysis but varied from 25%-80% for the different types of land uses on the 1.6 acre units.

SUPPORTED BY Ohio State Government

5.0044, OHIO SOIL SURVEY

N. HOLOWAYCHUK, Ohio Agric. Res. & Dev. Center, *Wooster, Ohio* 44691 (0065341; OHO00450-S)

OBJECTIVE: Participate in Ohio Soil Survey program; explore and test new soil survey techniques; map soils on representative landscapes and characterize soil mapping limits; update soil survey on field research areas.

APPROACH: The cooperative program will be continued in the conduct of medium intensity soil surveys of new counties and old surveys will be evaluated as to their suitability for land use planning. Panchromatic and multispectral remote sensing techniques with surface mapping procedures will be tested as to their feasibility for generalized and detailed mapping of soils in areas of different soil landscapes. Composition of soil mapping units and landscape features will be investigated. Soil surveys on field research areas will be reviewed and updated where needed.

PROGRESS: Soil surveys are conducted cooperatively by three agencies: USDA Soil Conservation Service; Ohio Department of Natural Resources, Division of Lands and Soil; Ohio Agricultural Research and Development Center. Detailed soil surveys are in progress in 20 counties: Auglaize, Belmont, Bulter, Carroll, Cuyahoga, Defiance, Franklin, Fulton, Geauga, Hamilton, Knox, Lucas, Madison, Pickaway, Seneca, Shelby, Trumbull, Tuscarawas, Wayne, Wyandot. Field mapping completed in Ashland and Logan Counties and surveys initiated in Hamilton, Knox, Tuscarawas and Wyandot Counties. Agreements for soil surveys developed for Athens, Darke and Licking Counties and meetings to discuss plans for soil surveys held in Athens, Darke, Holmes, Jackson, Licking, Noble, Perry and Sandusky Counties. Other activities: soil survey field reviews and correlation; updating soil series descriptions; review of the report, Engineering Characteristics of Ohio Soil Series; participation in Project NCR-3.

SUPPORTED BY Ohio State Government

5.0045, PRECIPITATION CHARACTERISTICS FROM DUAL WAVELENGTH DOPPLER RADARS

G.B. WALKER, Univ. of Oklahoma, School of Electrical Engin., *Norman, Oklahoma* 73069 (ATM76-19791)

The measurement of vertical wind velocity and drop-size distributions in precipitating regions of storm systems has been of great interest in recent years. However, accuracy in the estimate of these quantities has been limited by the need to make an assumption about one parameter to determine the other, thus limiting the utility of the results. Recently, it has been theoretically shown that use of multiple wavelength Doppler radars can provide independent estimates of vertical wind and dropsize distributions. Indeed, it is possible to estimate turbulence as well.

This research is proposed to estimate the vertical wind, dropsize distribution, and spectrum broadening effects, such as due to turbulence, from a vertically looking dual wavelength Doppler radar system. The experimental research proposed would use primarily existing equipment. Results obtained will be compared with other vertical wind and dropsize distributions measuring techniques.

The estimation of parameters above is based on a unique relationship between the fall velocity power spectra ratio from two different wavelengths and the radar scattering cross section ratio versus dropsize for the appropriate temperature. The latter ratio curve can be used to estimate the vertical wind and dropsize distribution in radar pulse volume. Turbulence, which broadens the velocity power spectrum, can be estimated by deconvolving the turbulence broadened spectrum, and the vertical velocity dropsize distribution subsequently defined.

SUPPORTED BY U.S. National Science Foundation, Div. of Atmospheric Sciences

5.0046, SOIL LANDSCAPE CHARACTERISTICS AFFECTING LAND USE PLANNING AND RURAL DEVELOPMENT

F.C. WESTIN, South Dakota State University, Agric. Experiment Station, *Brookings, South Dakota* 57006 (0062181; SD00642)

OBJECTIVE: Define, map, and evaluate soil landscape units in terms of alternative land uses in rural and suburban areas. Develop and publish soil landscape guides for land use planning and rural development.

APPROACH: Involve representatives from two or more agencies or disciplines in the planning, execution, and analysis. Evaluate the landscape units by the employment of new

techniques in remote sensing and photo-imagery and endeavor to perceive new delineations in the landscape which can also be quantified. Use technique of 'density slicing' to examine photo-imagery of selected soil landscapes. Guides for rural land assessment and county or township equalization procedures are being constructed. An ultimate goal is to develop a regional land resource map and data bank from which can be derived specific guides in tabular or graphic form for alternate land use planning and management.

PROGRESS: Approximately 1.5 million acres were surveyed by the South Dakota Cooperative Soil Survey this reporting period. In addition, four county soil surveys were published: Mellette, Hughes, Sully and Todd. These modern soil surveys are interpreted for best land use, for crop and range yields, and for forest, recreational and wetlands management. Cooperated with the South Dakota Department of Revenue to develop a procedure for evaluating agricultural land using soil survey data and county agricultural production data and expenses. Developed a format for computerizing soil maps so that the data can be presented in summary form to users. As many as 20 interpretative maps can be generated. Completed a study of 'geography of soil test results.' It was found that soil test results are significantly related to the classification of the soil. Continued study on the influence of soils on LANDSAT spectral reflectances. A generalized training set permitted recognition of corn, small grains, grass and water at 94% accuracy. Training data were then separated by vegetation category and soil differences investigated. The most pronounced differences were found among the corn data where soil associations could be identified correctly 73% of the time.

SUPPORTED BY U.S. Dept. of Agriculture, Cooperative State Research Service, South Dakota

5.0047, INTERNATIONAL SOUTHERN OCEAN STUDIES (ISOS) - A STUDY OF THE THERMAL STRUCTURE SOUTH OF AUSTRALIA

W.J. EMERY, Texas A & M University System, Graduate School, *College Station, Texas* 77843 (OCE76-81371)

This project is part of the International Southern Ocean Studies (ISOS). The long-range goal of ISOS is to understand the dynamics of the Antarctic Circumpolar Current.

This project provides for observations of upper ocean thermal structure from supply ships traveling between Australia and Antarctica during the austral summer of 1976/77. These ships would also make meteorological observations including sea surface temperature and salinity. These data will be combined with satellite information and with oceanographic data from the Soviet research ship Professor Zubov. The combined data set will be used to study the spatial and temporal structure of the Antarctic Circumpolar Current and the Polar Front in the region south of Australia.

SUPPORTED BY U.S. National Science Foundation, Div. of Ocean Sciences

5.0048, REMOTE SENSING FOR LAND RESOURCE MANAGEMENT WITH RANGELAND EMPHASIS

R.H. HAAS, Texas A & M University System, Agric. Experiment Station, *College Station, Texas* 77843 (0062471; TEX01978-RI)

OBJECTIVE: Investigate the use of remote sensing for inventorying rangelands and other natural ecosystems for local and regional resource management. Evaluate the use of aircraft and spacecraft sensor data for monitoring the effects of weather and management on short-term range feed conditions and long-term successional changes in vegetation. Acquire basic information on reflectance characteristic of natural vegetation systems for cataloging phenological effects. Evaluate the cost-effectiveness of potential remote sensing applications.

APPROACH: Sequential, multispectral imagery will be obtained from rangelands with known management treatments. Existing and new aerial photography will be evaluated for observable differences in reflectance characteristics and compared with 'ground truth' data collected at selected sites. Terrestrial and aerial photography, as well as vegetation data and existing soils information, will be used to evaluate satellite imagery for monitoring seasonal changes in vegetation conditions. Various types of remote sensing data will be evaluated as new information sources for practical application to the management of rangelands and other natural ecosystems.

PROGRESS: Research has made progress toward the application of both satellite data and aerial photography for land resource management. The NASA-sponsored Great Plains Corridor Study (LANDSAT I) shows that derived band ratio parameter (TVI-6) can effectively measure increments of green biomass as small as 200 kg/ha. A subsequent phase of this study (LANDSAT II) has been initiated to determine the importance of TVI-6 value for assessing range feed conditions and 'range readiness' on a regional basis. An additional study on the 'Evaluation of Multispectral Remote Sensing for Delineating Vegetated Landscapes' shows the potential for mapping rangeland soils in Texas. Important applications for use of color-IR aerial photography are shown in the study of 'Soil-site Relationships to Photodelineated Forest Types' at the Woodlands Development site. Structural characteristics of the forest types are related to the soils and can be delineated from 1:6000 or 1:12,000 scale aerial photography. Studies on 'Monitoring Range Improvement Following Brush Control' indicate that successional changes in vegetation can be evaluated with medium-scale multidate aerial photography.

SUPPORTED BY U.S. Dept. of Agriculture, Cooperative State Research Service, Texas

5.0049, LAND USE KEY FROM SMALL-SCALE AERIAL PHOTOGRAPHS

R.D. BAKER, Stephen F. Austin State Univ., School of Forestry, *Nacogdoches, Texas* 75961 (0067123; TEXY-74-026)

OBJECTIVE: Develop a land use interpretation key of the elimination type from small-scale ektachrome infrared photography. The key will employ some level II and some level III categories of the Land Use Classification System in the U.S. Geological Survey Circular 671. Apply the key to the location of a suitable site for a sanitary landfill.

APPROACH: High-altitude color infrared photography, taken April 1972, of Montgomery County, Texas, will be used. An elimination-type key will be employed to locate and delineate several areas of level II and III land uses. An analytical check will be made. A map will be prepared. From it a sanitary landfill site will be located, by using overlays depicting certain ameliorating factors for land use in the county.

SUPPORTED BY Texas State Government

5.0050, SHORELINE EROSION STUDY

K.G. WATTERSTON, Stephen F. Austin State Univ., School of Forestry, *Nacogdoches, Texas* 75961 (0067118; TEXY-74-012)

OBJECTIVE: Shoreline Erosion Study.

APPROACH: Measurement of shoreline changes from reservoir establishment maps, topo sheets, and air photos taken over time.

PROGRESS: Four factors were involved in the shoreline erosion process: wind direction, open water distance (fetch), texture of the subsoil, and degree of slope on the impacted shoreline. A table was developed to determine intensity of erosion as slight, moderate, or severe, depending on the combination of factors involved. Problems were encountered with available topographic maps, aerial photographs, and cooperation with reservoir development agencies. Recommendations were made to correct the problems encountered and to further study erosion rates.

SUPPORTED BY Texas State Government

5.0051, PATTERNS AND RATES OF PINYON JUNIPER WOODLAND INVASION AND SUPPRESSION OF UNDERSTORY VEGETATION

N.E. WEST, Utah Higher Education System, Agric. Experiment Station, *Logan, Utah* 84321 (0064999; UTA00750)

OBJECTIVE: Understand patterns of succession in Great Basin -pinyon-juniper woodlands.

APPROACH: Plots will be established in transects regularly arranged within the woodland belt on two Great Basin mountain ranges. Data on total vegetation, soils, slope, aspect and land use will be collected. Samples of trees and shrub stem sections will be taken to obtain age and growth rate data. These data will be re-

lated statistically and to aerial photographic coverage so mappable units can be devised and related the management problems and potentials.

PROGRESS: Further progress has been made on development of a general mathematical model of successional change in semi-arid woodlands. The model can now account for competition directly as a function of spatial availability of resources. This has been tested against data from single species stands available in the literature. Applications to floristically complex stands are being developed. This model uses the mathematical theory of dimensional analysis. The chief practical advantage of this approach is that data on a few, easily measured plant characteristics enable predictions of site productivity and successional status. Model validation on an independent set of data from a spectrum of juniper-pinyon stands remains. During the summer of 1975 much of the required raw data were obtained. Thirteen contiguous plots covering full successional gradients were located on the Needle Range in southwestern Utah. Each individual of each species sampled in each plot was measured for cover and an index of photosynthetic biomass. The relationship between the index and actual photosynthetic biomass is being established from additional data collected concomitantly. A cross section of each tree was collected for growth analyses. Biomass and growth data are now being reduced. When these data are available, the model will be applied. If close correspondence results, then methods of adjustment will be developed for application to other stand and site conditions for predictions of rates of woodland succession for the entire Great Basin.

SUPPORTED BY U.S. Dept. of Agriculture, Cooperative State Research Service, Utah

5.0052, PROTOTYPE EXPERIMENTAL GROIN, POINT MUGU, CALIFORNIA

D.W. BERG, U.S. Army, Coastal Engin. Res. Center, *Fort Belvoir, Virginia* 2206[illegible] (31237)

OBJECTIVES: To determine by prototype field experiments: (1) the manner in which a groin traps littoral materials; (2) the effect of groin shape and dimensions on the volume of entrapped littoral materials; and (3) the manner in which littoral materials move over, around or through a groin.

APPROACH: The field investigation of prototype groins requires the procurement of topographic and bathymetric surveys, ground and aerial photography, determination of longshore energy flux and the characteristics of sediments both spatially and temporally to document the functional behavior of selected groin configurations and their effect on adjoining shores. To date two impermeable groins and three permeable groins have been constructed and data collected on each. The first, a long, high impermeable groin, was in place from November '70 to November '71; the second, a short, low impermeable groin, was in place from April '72 to June '73. Permeable groins constructed in three phases provided increasing structure width and obstruction to the movement of littoral materials. Phase 1 was in place from June '74 to April '75; Phase 2, from April '75 to October '75; and Phase 3 from November '75 to present. (Phases 1-3 will be removed during FY 76.)

SUMMARY: The results of this prototype field experiment will be improved functional design criteria for groins and their effect on adjoining shores. This information will be made available by technical reports, revisions to SPM and be included in the proposed Coastal Engineering Manual. Two reports from this study have been printed; the first, CERC MP 1-72: 'Groins: An Annotated Bibliography' and the second, CERC RP 15-73: 'State of Groin Design and Effectiveness'. Complete analysis of the collected field data will result in technical reports in FY 77 and FY 78. It is anticipated that this information will allow increased understandng of the functional behavior of groins, the effects of groins on adjoining shores, reflect a more rational use of groins in shore protection projects and simplify their functional design. Further it is expected that this information will assist all Corps of Engineers Coastal Divisions and Districts, being directly responsive to SPD and NCD.

SUPPORTED BY U.S. Dept. of Defense, Army, Corps of Engineers

5.0053, MICROWAVE STUDIES

A.W. ENGLAND, U.S. Dept. of the Interior, Geological Survey, *Herndon, Virginia* 22092 (9790-01700)

STATES TO WHICH PROJECT PERTAINS: All States.

An airborne passive microwave survey is planned near Houston, Texas, to complete our evaluation of soil moisture patterns as indicators of buried fault structure. A theoretical study of radar backscatter by natural terrain will continue. Radar instrumentation will soon be installed on a Survey aircraft and actual surveys will be made to determine the feasibility of using radar to explore for natural, offshore oil seeps. A laboratory study of the dielectric properties of soils at microwave frequencies will soon commence. One purpose of this study is to evaluate the use of microwave techniques as an indicator of soil type.

SUPPORTED BY U.S. Dept. of the Interior, Geological Survey, Geologic Div.

5.0054, METALLOGENIC MAPS

P.W. GUILD, U.S. Dept. of the Interior, Geological Survey, *Herndon, Virginia* 22092 (9340-00244)

Continue assembling mineral deposit data for North America; plot data on map at 1:5,000,000, together with geologic/tectonic information, for visual analysis of their metallogenic significance, delineation of provinces and epochs, and their possible relationship to other events in earth history (particularly global tectonics). Enter data into computer storage for machine analysis in the future. Stimulate, maintain contacts with similar efforts on other continents.

Simplify, plot the data at 1:10,000,000 for the Circum-Pacific Minerals Map of NE Quadrant; advise on assembly and plotting of minerals data for the remaining quadrants (including Antarctica); codify the data for computer storage, retrieval, and analysis.

Maintain contact with IGCP Project 'Remote Sensing and Mineral Exploration,' based on LANDSAT imagery and mineral deposit data; a principal objective is to evaluate the role of lineaments and circular structures in localizing mineral deposits.

SUPPORTED BY U.S. Dept. of the Interior, Geological Survey, Geologic Div.

5.0055, ATMOSPHERIC OXIDATION RATES OF CARBON MONOXIDE AND METHANE

M.J. CAMPBELL, Washington State University, Graduate School, *Pullman, Washington* 99163 (ATM76-81263)

This research will determine the in situ oxidation rate of carbon monoxide and methane in the ground-level continental and marine air by carbon-14 technique. In conjunction with concurrent determinations of atmospheric variables (such as ozone concentration) these measurements will comprise a rather exacting test of existing models of atmospheric chemistry. Additionally, they will provide an absolute measurement of prevailing hydroxyl (OH) radical concentrations by a method quite unrelated to the resonance-fluorescence method, and will measure the importance of nitrogen dioxide reactions as a loss mechanism for these radicals.

SUPPORTED BY U.S. National Science Foundation, Div. of Atmospheric Sciences

5.0056, DEVELOP A SECTORIZED ARCHIVE UNIT FOR SYNCHRONOUS METEOROLOGICAL SATELLITE DATA

V.E. SUOMI, Univ. of Wisconsin, School of Natural Sciences, *Madison, Wisconsin* 53706 (ATM75-21048)

The purpose of this grant is to provide support to complete the development of an archive unit that will be capable of providing Synchronous Meteorological Satellite (SMS) and Geostationary Operational Environmental Satellite (GOES) data to any user in a common computer compatible formal at low cost. A special cassette recorder and magnetic tapes will serve as the major components of the archive.

SUPPORTED BY U.S. National Science Foundation, Div. of Atmospheric Sciences

LIFE SCIENCES

Includes Life Sciences (general); Aerospace Medicine; Behavioral Sciences; Man/system Technology and Life Support; and Planetary Biology.

6.0001, OPERATIONAL MEASURES OF IN-FLIGHT PERFORMANCE (22)
K.A. KIMBALL, U.S. Army, Aviation Psychology Division, *Ozark, Alabama* 36360 (DA0E6730)

To explore, in the operational environment, variables which affect aviator performance.

The approach will involve the utilization of an in-flight monitoring and recording system capable of sampling and recording nineteen channels of continuous analog and digital information, and an oculomotor monitoring device for eye movement recording during flight. Areas of research to be addressed will include: aviator oculomotor performance during conditions of VFR, IFR, low level and terrain flight, assessments of workload of pilot and copilot/navigator during terrain flight, and navigation performance during terrain flight under day and night conditions.

ADDENDA: Supporting agency address is: MD R & D COM (Army) Aeromedical Res. Lab., Ft Rucker, AL 36360.

SUPPORTED BY U.S. Dept. of Defense, Army

6.0002, AVIATION MEDICINE RESEARCH FOR AIRCREW SELECTION, RETENTION AND PHYSICAL PERFORMANCE STANDARDS
F.S. PETTYJOHN, U.S. Army, Aviation Medicine Res. Div., *Ozark, Alabama* 36360 (DA0B6895)

To provide the US Army information concerning the medical requirements for Army aircrew selection, retention, and physical performance.

To apply accepted medical research methodology and technology to accomplish the objective.

ADDENDA: Supporting agency address is: MDRDC Aeromedical Research Laboratory, Ft Rucker, AL 36362

SUPPORTED BY U.S. Dept. of Defense, Army

6.0003, DEVELOPMENT OF MEASUREMENT TECHNIQUES FOR THE MEDICAL ASSESSMENT OF VISUALLY COUPLED SYSTEM (VCS) COMPONENTS
R.W. WILEY, U.S. Army, Biooptics Division, *Ozark, Alabama* 36360 (DA0E6734)

To develop measurement techniques for the medical assessment of visually coupled system (VCS) components.

The first phase will be concerned primarily with the helmet mounted sight (HMS) component of the VCS. The approach during this phase will be to conduct laboratory and flight tests of the basic aiming and tracking performance of the head. In the laboratory, both static and dynamic aiming and tracking tests will be conducted in the man vibration laboratory. Vibration signatures experienced by the subject in the dynamic aiming and tracking tasks will be typical of those he would experience in the Cobra attack helicopter during a series of combat maneuvers. Projected areas of investigation include the determination of the effect of custom-fitted versus standard helmets and the effects of selective frequency filtering in the HMS output. Base line laboratory data will be taken with the bare head (negligible instrumentation weight) and head with SPH-4 helmet. The second phase of this effort will be concerned with an investigation of helmet mounted display image quality. The major force of this investigation will be aimed at determining the ramifications of using monochromatic video displays and their effects on display image quality as perceived by the human observer. It is possible to inadvertently compromise an aviator's safety and physiological performance when designing and fabricating a VCS. This is because of the intimate and delicate interface which exists between the man and the machine in a VCS. It is therefore imperative for investigators with health sciences backgrounds as well as investigators with engineering sciences backgrounds to be involved in the design, fabrication, and testing of visually coupled components and systems that are going to be integral to the advanced attack helicopter (AAH) and advanced scout helicopter (ASH) visionics.

ADDENDA: Supporting agency address is: MDRDC Aeromedical Research Lab, Ft Rucker, AL 36362

SUPPORTED BY U.S. Dept. of Defense, Army

6.0004, FACTORS AFFECTING ASSIMILATORY NITRATE REDUCTION BY PROKARYOTES
E.R. LEADBETTER, Amherst College, School of Liberal Arts, *Amherst, Massachusetts* 01002 (NSG 7325)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Organization & Management Office, Office of University Affairs

6.0005, MODELLING TRANSIENT MOTION CUE EFFECTS
A.M. JUNKER, Bolt Beranek & Newman Inc., *Cambridge, Massachusetts* 02138 (DF320790; F33615-77-C-0506)

At AMRL-EM, an extensive research program is being pursued to investigate motion related performance of the pilot (human operator). This effort includes basic studies to determine (a) how pilots utilize motion related sensory cues in real or simulated flight and (b) how this aspect of pilot response behavior can be included in models for pilot/vehicle systems. Bacause many tracking tasks of interest to the military (e.g., air-to-air combat) are nonsteady state, the pilot model must be applicable for transient, as well as steady-state, maneuvers. Therefore, the objective of this work unit is to investigate the effects of motion in nonsteady-state tracking situations. The present Bolt Beranek and Newman, Inc., (BBN) pilot model contains features needed to explore the various aspects of motion cues in transient tasks. Therefore, BBN's assistance will be utilized through this work unit.

A program to explore the pilot's use of motion cues in transient aircraft maneuvers will be performed. BBN will assist in the validation of a model concerned with the pilot's use of motion dues during transient aircraft maneuvers. This analytic study will be correlated with an ongoing experimental study at AMRL/EM.

ADDENDA: Supporting agency address is: 6570 Aerospace Medical Rsch Lab EM, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense, Air Force

6.0006, BIOLOGICAL ADAPTATION TO LOW TEMPERATURE - MOLECULAR MECHANISM GOVERNING RESPONSES OF THE PROTEIN SYNTHESIZING APPARATUSES (ABBREV)
D.H. POPE, Rensselaer Polytechnic Inst., School of Science, *Troy, New York* 12181 (NSG 7345)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Organization & Management Office, Office of University Affairs

6.0007, DETERMINE RETINAL SENSITIVITY TO COLOR INTENSITY FOLLOWING INTENSE MONOCHROMATIC LIGHT ADAPTATION BY ELECTROPHYSIOLOGICAL TECHNIQUES
M.L. WOLBARSHT, Duke University, School of Medicine, *Durham, North Carolina* 27706 (DF319770; F41609-76-C-0020)

To develop data on laser effects on the eye relative to Air Force laser safety standards. This work will delineate means by which retinal ganglion cell responses can be used to evaluate color vision and visual field loss following laser exposure of the rhesus monkey eye.

Use of single cell electrophysiological technique, to evaluate laser exposure effects in the rhesus monkey retina.

ADDENDA: Supporting agency address is: USAF School of Aerospace Medicine RA, Brooks AFB, Texas 78235

SUPPORTED BY U.S. Dept. of Defense, Air Force

6.0008, CONTROL CONCEPT DEVELOPMENT
J.H. BLACK, U.S. Air Force, Aerospace Medical Res. Lab., *Dayton, Ohio* 45433 (DF319110)

To develop and evaluate advanced man-centered control concepts for improved operator performance in modern USAF

weapon systems. Areas of research include: analysis of operator control dynamics, application of human engineering to the design of controller hardware and software, identification of display formats which optimize operator feedback, investigation of new techniques for integration of the operator in a control task situation, and optimum integration of control and display with consideration of overall man-machine system dynamics. The results will establish the applicability, utility and tradeoffs of hand, head and/or eye directed fire control, reconnaissance, and remotely piloted vehicle (RPV) systems. Of special interest is the application of head and/or eye line-of-sight for selection and display of task-related information in the control of manned and unmanned weapon systems.

Experimental studies will be conducted in a fixed-base laboratory and in simulated flight environments incorporating vibration and acceleration stressors. Complementary in-flight testing will be utilized to validate ground-based results, including the applicability of control/display integration concepts developed in the laboratory. Initial laboratory experimentation will compare operator control performance with a joysticks, helmet mounted sight (HMS) and oculometer. Resulting data will establish a baseline for predicting and evaluating man-machine performance with advanced control systems. The empirical data will also be used to identify operator parameters and to develop analytical representations of operator control dynamics. Additional experimentation will address the effects of various joystick designs and will consider rate or position dynamics for head and eye directed control systems. An evolution of hybrid control techniques is expected involving combinations of hand, head and/or eye control with signal processing to provide optimum scaling and filtering as directed by specific control tasks. These concepts will be developed and evaluated in the laboratory and, when appropriate, validated on an airborne test bed. Concurrent investigations will study the effect of operator feedback formatting on control task performance. The control concept implications of multiple resolution and predictor type displays will be studied with emphasis on resulting sensory and psychomotor response function.

SUPPORTED BY U.S. Dept. of Defense, Air Force

6.0009, NOISE CONSULTATION AND RESEARCH FOR U.S. EPA

D.L. JOHNSON, U.S. Air Force, Aerospace Medical Res. Lab., *Dayton, Ohio* 45433 (DF321270)

The EPA is directed by the Noise Control Act of 1972 to regulate noise in the United States to within exposure conditions that are safe and acceptable from a health and welfare standpoint. The objective of this effort is to provide noise effects research on problems of mutual EPA/USAF interest and also to provide consultation on the entire spectrum of noise exposure problems based upon the extensive AF noise experience over the past three decades. The research results will provide a technology base for use by EPA in the promulgation of their regulations and the technical noise expertise will provide analytical reviews, comments and recommendations regarding research proposals, programs and strategies considered for use by EPA.

The approach is for AMRL scientific and technical personnel to conduct and monitor research efforts of mutual AF/EPA interest in the safety and effectiveness of persons in noise environments. AMRL will also provide consultation by responding to specific requests to review EPA documents, practices and programs as well as those proposed and implemented by other agencies. Since a majority of these requests occur without prior notice and in a rather random fashion, it is impossible to project a schedule of events.

ADDENDA: Supporting agency address is: 6570 Aerospace Medical Rsch. Lab BB, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense, Air Force

6.0010, COMPARATIVE RESPONSE OF MAN AND ANIMALS EXPOSED TO IMPACT

L.E. KAZARIAN, U.S. Air Force, Aerospace Medical Res. Lab., *Dayton, Ohio* 45433 (DF322420)

Spinal injuries due to abrupt gz impact forces occur frequently in the operational Air Force environment. Injury patterns experienced are diversified, and range from simple vertebral body fracture to vertebral subluxation with spinal cord and nerve root involvement. The objective of this investigation is to provide an in-depth biomechanical and clinical analysis of operational spinal injury patterns for purposes of supporting injury prediction model development, which will in turn be used as system design aids, and further to understand the microscopic and macroscopic failure mechanisms which are involved in the kinetic and kinematic events resulting in injury.

Interspecies scaling relationships will be formulated between the squirrel monkey, rhesus monkey, baboon, chimpanzee and man. The musculoskeletal system will be modeled based upon geometry and material property data. Experimental data will be collected on isolated vertebral bodies, vertebral units and the points of rib articulation. Data will be collected on the ranges of torso motion. These data will be integrated into a generalized mathematical model of the torso. Experimental data will be collected on injury modes and correlated to specific support and restraint goemetries for model injury prediction validation. Subsequent studies will be made applying the model to the predictive analysis of injury for various restraint configurations and modes of human exposure in potential and existent Air Force systems.

ADDENDA: Supporting agency address is: 6570 Aerospace Medical Rsch Lab BB, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense, Air Force

6.0011, INFLIGHT EVALUATION OF COCKPIT THERMAL ENVIRONMENT

R.C. LIGDAY, U.S. Air Force, School of Aerospace Med., *San Antonio, Texas* 78235 (DF322670)

Air Force operations expose personnel to a wide variety of thermally stressful conditions both inflight and on the ground. Accurate measurements of field conditions are necessary to provide a data base to determine the adequacy of environmental control systems and individual thermal stress protective garments. Previous accomplishments in this area are documented under work unit 7164-17-23. This work unit is being established to implement a new technology objective as directed by HQ Aerospace Medical Division. Application of data obtained from this work unit is being performed under work unit 7930-12-04.

Unique, USAFSAM-developed instrumentation will be used to record dry bulb temperature, dew point, air flow, black globe temperature, heart rate, body core and multiple skin temperatures. Inflight data will be obtained from experimental aircraft stationed at Edwards AFB and operation aircraft located in thermally stressful areas of the United States.

ADDENDA: Supporting agency address is: USAF School of Aerospace Medicine VN, Brooks AFB, Texas 78235

SUPPORTED BY U.S. Dept. of Defense, Air Force

6.0012, AUTOMATED PATIENT RECORD SYSTEM

M.E. WOMBLE, U.S. Air Force, School of Aerospace Med., *San Antonio, Texas* 78235 (DF322080)

To determine the feasibility of incorporating the USAFSAM central waiver repository file into a system capable of giving medical personnel in the Surgeon General's office instantaneous access to the file on a 24-hour basis.

A smart-disc system capable of automatically receiving requests and corrections, sorting files, and transmitting desired records will be designed. Concurrently, with the development of the disc-systems, an intelligent terminal will be designed which will automatically communicate with the disc-system. Both the disc-system and the terminal will be built and evaluated, with the terminal at Randolph AFB and the disc-system at Brooks AFB. The terminal will then be installed at the Surgeon General's office and further evaluated. This is a new effort for fiscal year 1977.

ADDENDA: Supporting agency address is: USAF School of Aerospace Medicine NG, Brooks AFB, Texas 78235

SUPPORTED BY U.S. Dept. of Defense, Air Force

MATHEMATICAL AND COMPUTER SCIENCES

Includes Mathematical and Computer Sciences (general); Computer Operations and Hardware; Computer Programming and Software; Computer Systems; Cybernetics; Numerical Analysis; Statistics and Probability; Systems Analysis; and Theoretical Mathematics.

7.0001, GENERAL SIMILARITY SOLUTION OF THE TRICOMI EQUATION AND ITS APPLICATIONS
J.D. COLE, Univ. of California, School of Letters & Science, *Los Angeles, California* 90024 (DF046600; AF-AFOSR-3173-77)

AF function - aerospace vehicle design. Opportunity - possibly more economical transonic wing design. Objective - improved analytic techniques for compressible flow problems. How work contributes -numerical parameter optimization is often aided by analytic understanding.

The general similarity solution for a partial differential equation can be found by studying the infinitesimals of the group of transformations which leave the equation invariant. The tricomi equation is the simplest partial differential equation of mixed type. The four parameter group which leaves the tricomi equation invariant has been found. It is proposed to study the resulting similarity forms, the geometry of the similarity curves, and to construct the general solution of the ordinary differential equations which result. These solutions can be interpreted as the hodograph streamlines of a transonic flow. Thus new classes of practical flows will be generated by interpretation of particular similarity solutions and their superposition if necessary.

ADDENDA: Supporting agency address is: AF Office of Scientific Research NM, Bldg 410, Bolling AFB, DC 20332

SUPPORTED BY U.S. Dept. of Defense, Air Force

7.0002, DEVELOPMENT AND IMPLEMENTATION OF EFFICIENT SPARSE MATRIX ALGORITHMS
P.S. JENSEN, Lockheed Missiles & Space Co., *Palo Alto, California* 94304 (DF044770; F49620-76-C-0003)

AF function - design of structures for aerospace vehicles with high stiffness-to-weight ratio. Deficiency - the analysis of structures is hampered by the limited capacity of present computer programs to handle the very large matrices arising in such analysis efficiently. Objective - this research intends to develop and implement matrix factorization schemes to permit the efficient handling of very large sparse matrices which cannot reside in high-speed memory. How work contributes - this work will lead into the development of computational software for the solution of structural analysis problems which use either finite-difference or finite-element techniques.

Algorithms for processing large, sparse, symmetric matrices arising from discrete analysis of partial differential equations will be developed, tested and documented. The emphasis will be on direct methods for problems that are too large to fit in high-speed memory. The effort will be divided into three parts: (1) development and implementation of a direct factorization algorithm, (2) development and implementation of support algorithms for equation ordering and matrix solving and multiplying, and (3) test and document the computer program implementations.

ADDENDA: Supporting agency address is: AF Office of Scientific Research NM, Bldg 410, Bolling AFB, DC 20332

SUPPORTED BY U.S. Dept. of Defense, Air Force

PHYSICS

Includes Physics (general); Acoustics; Atomic and Molecular Physics; Nuclear and High-energy Physics; Optics; Plasma Physics; Solid-state Physics; Thermodynamics and Statistical Physics. For Related Information See Also Engineering.

8.0001, THEORETICAL AND EXPERIMENTAL STUDIES OF MAGNETIC SOLIDS
L.M. FALICOV, Univ. of California, School of Letters & Science, *Berkeley, California* 94720 (INT76-05452)

The basis for this program of collaboration consists of several projects centered around the study (both theoretical and experimental) of Raman scattering in solids, mostly on magnetic systems, and in particular, those involving rare-earth ions and mixed-valence species. The theoretical studies will also be extended to other properties of the transition-metal compounds.

Research in these areas is ongoing at the University of California at Berkeley and the Instituto de Fisica of the University of Campinas, Brazil, with preexisting sources of support. Under the U.S.-Brazil Cooperative Science Program, funding is being provided by both countries to support formal cooperation in this research area between the two institutions.

SUPPORTED BY U.S. National Science Foundation, Div. of International Programs

8.0002, NUCLEAR PHYSICS AND RELATED RESEARCH IN ASTROPHYSICS, GEOPHYSICS AND TECHNOLOGY
T.A. TOMBRELLO, Calif. Inst. of Technology, Graduate School, *Pasadena, California* 91109 (PHY76-83685)

The research to be supported by this grant is in nuclear physics and related fields. It will be carried out in the Kellogg Radiation Laboratory, which has a history of significant contributions in these areas of research. The program covers many aspects of nuclear phenomena particularly as they relate to stellar processes and how the geological and astronomical record of elemental and isotopic abundances can be analyzed to elucidate their production mechanisms. The research activities are: nuclear physics and experimental nuclear astrophysics, theoretical nuclear astrophysics, nuclear geophysics and planetary science, atomic physics, and applied nuclear physics. These areas are closely related, and there is considerable interaction between the projects.

This research is a continuation of that currently supported by Foundation grant PHY76-02724 A01.

SUPPORTED BY U.S. National Science Foundation, Div. of Physics

8.0003, RESEARCH ON THE PROPERTIES OF MATERIALS AT VERY LOW TEMPERATURES
J.C. WHEATLEY, Univ. of California, Graduate School, *San Diego, California* 92037 (EY-76-S-03-0034)

The orbital properties of superfluid He3-A are some of the most novel properties of this new superfluid. In our new work we will study both the cause and nature of the persistent orbital motions discovered last year and the orbital response following sudden changes in a magnetic field. We are also studying the anomalous static magnetism in He3-B and the nature of spin relaxation in both the A and B phases. A nuclear cooling apparatus has been built and will be put in operation to extend the range of measurements to lower pressure and temperature. Heat flow in He3-A will be monitored ultrasonically and the thermal resistance measured using fluid aligned by a rotating magnetic field. The possible orienting effect of an electric field will also be studied. Work on spin transport in submonolayer films of He3 on grafoil will be begun.

SUPPORTED BY U.S. Energy Research & Development Admin., Div. of Physical Research

8.0004, LOW-ENERGY X-RAY AND ELECTRON PHYSICS AND APPLICATIONS TO DIAGNOSTICS DEVELOPMENT FOR LASER-PRODUCED PLASMA RESEARCH
B.L. HENKE, Univ. of Hawaii, School of Arts & Sciences, *Honolulu, Hawaii* 96822

This program is an extension of an ongoing project in Low Energy X-Ray and Electron Physics for the following specific reasons: 1. For immediate application to the development of 1 p-sec X-ray streak and framing cameras as required for high-resolution compression and emission studies--Detailed studies of the electron emission spectra (secondary, Auger and photoelectron) from photocathode materials and of the parameters that determine the shape of the electron energy distribution and of the conversion efficiency. 2. The development of special methods and techniques of X-ray spectroscopy in the kilovolt energy region as might be applied to the quantitative spectral analysis of high-temperature plasma sources, including--The measurement of the spe-

cial properties of available large d-spacing crystal analyzers (coefficient of reflection and resolution) appropriate for particular regions of low-energy X-ray spectra. The construction of high transmission, point focussing monochromators of such multilayer systems as lead stearate. And the establishment of a facility for the evaluation and the absolute calibration of low-energy X-ray detectors.

SUPPORTED BY U.S. Energy Research & Development Admin., Div. of Laser Fusion

8.0005, FAST ION COLLISIONS WITH THIN FOILS AND SURFACES
H.G. BERRY, Univ. of Chicago, School of Physical Sciences, *Chicago, Illinois* 60637 (PHY76-81060)

Investigation will continue of atomic orientation and alignment induced by the interactions of fast ion beams with solids--both in transmission through thin solid foils and in reflection scattering from surfaces. Careful analysis of these proposed experiments will greatly aid in understanding the problem of the nature of the interaction of fast ions with solid surfaces.

This work is a continuation of that currently supported by National Science Foundation grant PHY75-03266A01.

SUPPORTED BY U.S. National Science Foundation, Div. of Physics

8.0006, CHEMICAL PHYSICS INVESTIGATIONS USING MASS SPECTROMETRY
M.G. INGHRAM, Univ. of Chicago, School of Physical Sciences, *Chicago, Illinois* 60637 (CHE75-04255 A03)

Dr. Inghram plans to continue a program of research currently supported by Foundation grant, GP-35671X. He intends to study the effect of a variety of perturbations of atoms and molecules. He will investigate collisions of atoms and molecules with radiation, mostly photons; the effect of high electrostatic fields on atoms and molecules both in the presence of a surface and in vacuum.

The parameters of interest include: (1) Energy states of atoms and molecules; (2) Transition probabilities between states, i.e., Franck-Condon factors; (3) Kinetics of dissociation of excited molecules; (4) Field ionization, e.g., resonance tunneling; field induced dissociation; and surface physics.

The techniques which will be used include: (1) photoionization of atoms and molecules with energy analysis and/or mass spectrometric analysis of the particles produced; (2) field ionization of atoms and molecules with energy and mass spectrometric analysis of the ions resulting.

SUPPORTED BY U.S. National Science Foundation, Div. of Chemistry

8.0007, RECOIL STUDY OF REACTIONS INDUCED IN COMPLEX NUCLEI BY HIGH-ENERGY PROTONS (1 TO 400 GEV)
L. WINSBERG, Univ. of Illinois, School of Liberal Arts & Sci., *Chicago, Illinois* 60607 (EY-76-S-02-2324)

We propose to continue studying the mechanism of various nuclear reactions induced in complex nuclei by high-energy protons. Results of a recent study of 27Al and 197Au will be analyzed by a new procedure to determine the reaction parameters. A survey of similar studies in the literature will be made by this new analytical method, because most of the previous work was only partially analyzed. When the survey is completed, more recoil experiments will be made in order to fill in gaps in our knowledge.

We also plan to participate in the study, recently started, titled 'High-energy mechanisms by the measurement of the angular and energy distributions of nuclei recoiling from targets bombarded with 400 Gev protons.' This joint project is being performed at the Fermi Accelerator at Batavia.

RESULTS: Recoil measurements on 7Be complete a study on 5 nuclei produced in the bombardment of 27Al by protons in the 1 to 300 Gev range. A similar study on 149Tb from 197Au was also completed. A new method of analyzing 'thick-target thick-catcher' experiments was devised in order to determine the reaction parameters of these experiments. The forward momentum imparted by the incident particle, the average range of the product nucleus, and related parameters are given by this analysis.

SUPPORTED BY U.S. Energy Research & Development Admin., Div. of Physical Research

8.0008, PROPERTIES OF SUPERCONDUCTORS
D.M. GINSBERG, Univ. of Illinois, School of Liberal Arts & Sci., *Urbana, Illinois* 61801 (DMR76-80159)

Research under this grant will be a continuation of work begun under NSF Grant No. DMR73-07581. This project will investigate some of the properties of simple (non-transition) element superconductors with 3d-element magnetic impurities. The samples will be quench-condensed films. In such samples, the impurities provide localized magnetic moments which perturb the conduction electrons rather strongly. We will measure electron tunneling into these materials, and their critical magnetic fields and electromagnetic response functions (penetration depths). The results will help to test the theories of Shiba and of Muller-Hartmann and Zittartz, which go beyond the first Born approximation.

SUPPORTED BY U.S. National Science Foundation, Div. of Materials Research

8.0009, THEORETICAL STUDIES OF NUCLEAR STRUCTURE AND REACTIONS
E.R. MARSHALEK, Univ. of Notre Dame, School of Science, *Notre Dame, Indiana* 46556 (PHY77-08056)

Research in Theoretical Nuclear Physics initiated under NSF grant PHY74-01024 AO1 will be continued. Topics in nuclear structure and nuclear reactions to be investigated include: Nuclear Structure (Marshalek) 1. High spin states in deformed nuclei 2. Strongly anharmonic collective motion 3. Volume conserving effective interactions. Nuclear Reactions (Shanley) 1. Parity mixing in overlapping resonances 2. Isospin mixing in 8Be 3. Four-body problem 4. Four nucleon system 5. Electromagnetic mass shifts in nuclei.

SUPPORTED BY U.S. National Science Foundation, Div. of Physics

8.0010, COOPERATIVE PHENOMENA IN THE ELECTRICAL CONDUCTIVITY OF COMPOSITE MATERIALS
J.P. STRALEY, Univ. of Kentucky, School of Arts & Sciences, *Lexington, Kentucky* 40506 (DMR76-11462)

The conduction threshold which occurs in resistor networks when certain fractions of the resistors have zero conductivity may be treated as a critical point. A homogeneous function representation (or 'scaling theory') for the conductivity in the vicinity of the conduction threshold has been proposed and checked against an idealized model (the Bethe lattice). This theory will be extended to general composite systems, such as suspensions of small conducting particles in an insulating medium, or lattices (of various dimensionality) of randomly chosen elements. Various theoretical problems arising in this generalization will be attacked - such as the dependence of the macroscopic parameters on the probability distribution governing the conductivity of a single element, the range of correlations in such systems, the dependence of the critical exponents on local geometry, and the possibility of treating continuum models. Specific models, in particular small two- and three-dimensional lattices, will be solved numerically for comparison with the theory.

SUPPORTED BY U.S. National Science Foundation, Div. of Materials Research

8.0011, RADIO-FREQUENCY SIZE EFFECT MEASUREMENTS IN METALS
R.G. GOODRICH, Louisiana State Univ. Systems, Graduate School, *Baton Rouge, Louisiana* 70803 (DMR76-81866)

The research program of radio-frequency size effect measurements in high purity metals and the calculations necessary to interpret the measurements which previously was supported by

NSF grant DMR73-02427AO2 will be continued. This research program has three parts: The Fermi surfaces of rhenium and other metals will be accurately determined; relaxation processes involving the electronic carriers in gold, silver and in other metals will be investigated; and detailed computer calculations will be performed to aid in the interpretation of the measurements.

This is the lst year of a 3-year continuing grant.

SUPPORTED BY U.S. National Science Foundation, Div. of Materials Research

8.0012, HIGH-TEMPERATURE PLASMAS

C.S. LIU, Univ. of Maryland, Graduate School, *College Park, Maryland* 20740 (PHY76-02565 A03)

Experimental and theoretical studies of the properties of magnetically confined, nonneutral electron plasmas will be continued. The recently established Joint Program between Maryland and the Princeton Plasma Physics Laboratory to study the synchrotron emission from tokamak plasmas will also be continued.

The ongoing Maryland-based program on nonneutral plasmas studies nonneutral electron plasmas of 10 to the 11th power electrons with 2.2 MeV mean energy and lifetimes of more than 10 msec. Theoretical investigations of the equilibrium, stability, and synchrotron emission properties of magnetically confined nonneutral plasmas with particular emphasis on studies pertinent to the Maryland mirror and unneutralized beam experiments will also be continued.

The Joint Maryland-Princeton Program involves the measurement of the time-resolved spectral distribution and polarization of the synchrotron radiation emitted by tokamak plasmas. Measurements are under way using the Princeton Large Torus (PLT), currently the largest tokamak in operation.

This work is a continuation of that currently supported by Foundation grant PHY76-02565 A01.

SUPPORTED BY U.S. National Science Foundation, Div. of Physics

8.0013, RESEARCH OF HIGH-RESOLUTION VACUUM ULTRAVIOLET ABSORPTION CROSS SECTIONS OF STRATOSPHERIC MOLECULES

W.H. PARKINSON, Harvard University, School of Arts & Sciences, *Cambridge, Massachusetts* 02138 (NSG 5176)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Organization & Management Office, Office of University Affairs

8.0014, IMPURITY EFFECTS IN AMORPHOUS SEMICONDUCTORS 14454-P

W. PAUL, Harvard University, School of Arts & Sciences, *Cambridge, Massachusetts* 02138 (DA0F8925; DAAG29 77 G0059)

To determine the transport properties, optical response and junction response characteristics of amorphous materials produced and doped by an rf sputtering technique. Relevance - if successful, this program would determine the type of new or replacement devices one could realize from elemental and binary amorphous semiconductors. The ability to fabricate useful semiconductor devices from amorphous materials would have a favorable cost impact and lead to harder types of devices.

A systematic series of experiments will be performed based on a sputtering method in which Ge, Si, GaAs and possibly other binary compounds will have their defect dangling bond densities compensated, residual non-stoichiometries corrected, and donor and acceptor states reintroduced in a controlled way. Transport properties, optical response, and junction response will be measured.

ADDENDA: Supporting agency address is: DARCOM Army Research Office, Box 12211, Research Triangle Park, NC 27709

SUPPORTED BY U.S. Dept. of Defense, Army

8.0015, MATERIAL SUPPORT TECHNOLOGY - MAGNETOTRANSPORT STUDIES IN SEMICONDUCTORS

V.K. ARORA, Western Michigan University, School of Arts & Sciences, *Kalamazoo, Michigan* 49008 (DN675578; N00014-76-C-0888)

Calculations of the properties of semiconductor materials, for use in electronic devices that find application in naval systems, in the presence of high electric and magnetic fields are exceedingly difficult and few viable procedures exist. This program will seek to exploit a new formulation of the problem that promises to alleviate this difficulty.

Calculations will be carried out on magnetotransport effects in semiconductors in the presence of electric fields and thermal gradients. A quantum mechanical approach based upon the solution of Liouville's equation for the density matrix will be utilized. Results will be extended to the cases of nonparabolic bands, inelastic acoustic scattering, many-valleyed band structure, and the effects of high electric fields.

ADDENDA: Supporting agency address is: Office of Naval Research, Arlington, VA 22217

SUPPORTED BY U.S. Dept. of Defense, Navy

8.0016, RESEARCH AT RUTGERS NUCLEAR LABORATORY

G.M. TEMMER, Rutgers the State University, Graduate School, *New Brunswick, New Jersey* 08903 (PHY77-02534)

This research program includes nuclear reaction studies, particularly with polarized beams, plus very active work on solid-ion interactions, particularly blocking and channeling of ions.

This work represents a continuation of that supported under Foundation grant no. PHY75-00950 A02.

SUPPORTED BY U.S. National Science Foundation, Div. of Physics

8.0017, MEASUREMENT AND ANALYSIS OF NEUTRON CROSS SECTIONS

J.B. GARG, State University of New York, School of Arts & Sciences, *Albany, New York* 12222 (EY-76-S-02-2439)

The measurement of high-resolution neutron total and capture cross sections in certain nuclei which might be of interest to the development of nuclear energy program and to a better understanding of neutron interaction with nuclei would be made.

During this period we plan to measure these total neutron cross sections in the separated isotopes of chromium and gallium in the energy range of few keV to about 1MeV with the ORELA facilities. We would also complete the analysis of the data on the separated isotopes of zinc (64Zn, 66Zn, 67Zn, 68Zn and 70Zn) and yttrium taken in the last two contract years and the analysis of data on 57Fe. Additional measurements of total capture cross section in separated isotopes of zinc would be undertaken.

RESULTS: The measurement and analysis of total neutron cross section in the following nuclei have been completed: 209Bi, natural copper, 63Cu, 65Cu, 54Fe, 56Fe, 51V, 55Mn, 59Co, 58Fe. The results of total capture in 63Cu and 65Cu have been published. The (n,gamma) spectral studies on 168Er have been published.

SUPPORTED BY U.S. Energy Research & Development Admin., Div. of Physical Research

8.0018, THE TOTAL CROSS SECTION OF NU AND ANTINEUTRINO AS A FUNCTION OF ENERGY AND THE RATIO OF THESE CROSS SECTIONS

R.L. COOL, Rockefeller University, Graduate School, *New York, New York* 10021 (EY-76-C-02-2232A)

The objective is to make measurements of the total cross sections of nu and antineutrino as a function of momentum at an accurate level of about 5% and to study the production of dimuons.

Part 4 of 6.

SUPPORTED BY U.S. Energy Research & Development Admin., Div. of Physical Research

8.0019, TRANSITION TEMPERATURE AND RELATED PROPERTIES OF SUPERCONDUCTORS
P.B. ALLEN, State University of New York, School of Arts & Sciences, *Stony Brook, New York* 11790 (DMR76-82946)

Research under this grant will be an extension of work begun under NSF Grant DMR74-13593. The proposed program has two closely related parts: (1) a continuing study of the basic physics governing the superconducting transition temperature Tc; and (2) a study of the theory of electrical transport in d-band metals. State-of-the-art electronic band structures for d-band metals are to be used to extract coupling constants and many-body effects from transport and superconducting data and they are also to be used to attempt first principle calculations of the superconducting coupling constants. Calculations of new many-body effects (not found in the free electron gas) will be undertaken and the consequence for superconductivity will be studied.

This is the first year of a two-year continuing grant.

SUPPORTED BY U.S. National Science Foundation, Div. of Materials Research

8.0020, OPERATION OF THE STONY BROOK NUCLEAR STRUCTURE LABORATORY
D.B. FOSSAN, State University of New York, School of Arts & Sciences, *Stony Brook, New York* 11790 (PHY75-11185 A02)

The nuclear physics research at Stony Brook will include detailed studies of the electromagnetic properties of nuclear levels and the careful measurement of nuclear moments. The accurate results which are obtained, especially with the use of heavy-ion projectiles, serve as sensitive tests of theories of nuclear structure.

This grant renews support for research previously funded by NSF grant PHY75-11185.

SUPPORTED BY U.S. National Science Foundation, Div. of Physics

8.0021, THEORETICAL PHYSICS
C.N. YANG, State University of New York, School of Arts & Sciences, *Stony Brook, New York* 11790 (PHY76-15328 A01)

Theoretical research will include work on: 1. Topics in classical gauge fields. 2. Gravity. 3. Quantized gauge fields. 4. Super symmetries. 5. High-energy collisions and hadronic structure. 6. Electromagnetic and weak interactions. 7. New particles.

This work is a continuation of that currently supported by Foundation grant PHY74-13208A02.

SUPPORTED BY U.S. National Science Foundation, Div. of Physics

8.0022, STUDIES OF NUCLEAR PROCESSES
E. MERZBACHER, Univ. of North Carolina, School of Arts & Sciences, *Chapel Hill, North Carolina* 27514 (EY-76-S-05-2408)

The studies of nuclear processes will continue to emphasize the following topics: I. High-resolution studies of isospin-forbidden reactions, II. Polarized deuteron experiments, III. Ion source development and instrumentation, IV. Nuclear structure and reaction theory, V. Deep inelastic atomic collisions.

Experimental work will be carried out at the Triangle Universities Nuclear Laboratory (TUNL), using proton and deuteron beams from the polarized ion source. The source will be improved and a new polarization monitoring and beam control system installed. Narrow isospin-forbidden resonances will be studied at a new target chamber location with polarized beams and high resolution. Polarized deuteron beams will be used to study one- and two-nucleon transfer, particle-transfer reactions, and elastic scattering on heavy targets.

Coherence properties of particle wave packets, spin-orbit coupling and heavy-ion scattering, and compound nucleus fluctuation theory will be studied.

In the atomic collision program, the curved crystal X-ray spectrometer will be used to study satellite and hypersatellite spectra.

Two-electron-one-photon processes will be studied.

Theories describing the atomic effects to be expected in nuclear reactions will be extended. The sudden approximation in quantum mechanics will be studied in some detail.

RESULTS: The various results of this ongoing research program are published in the literature. A full account of all publications is contained in the annual Progress Reports, which are issued from the Department of Physics and Astronomy at Chapel Hill under the number ORO-(2408).

SUPPORTED BY U.S. Energy Research & Development Admin., Div. of Physical Research

8.0023, METALS AND ALLOYS
L.D. ROBERTS, Univ. of North Carolina, School of Arts & Sciences, *Chapel Hill, North Carolina* 27514 (DMR75-17924 A01)

Investigations of the electronic properties of metals and alloys previously supported by NSF grant DMR-7307500 A02 will be continued. Metals and alloys will be investigated through the use of a number of closely correlated experimental and theoretical methods. This work will be directed toward gaining more complete information about (a) the alloy wave function in the inner, or core, region of the atoms, (b) the alloy wave function in the immediate vicinity of the alloy atoms, (c) the forces binding the alloy atoms, and (d) toward obtaining a comprehensive theoretical description of some aspects of alloy work in terms of a RAPW pseudopotential treatment. The experimental studies will principally include Mossbauer effect measurements, X-ray chemical shift measurements, and impurity electrical resistance and magnetic studies including Kondo effect measurements. Some of this work will be done at high pressures and at low temperatures. RAPW pseudopotential calculations will be made which will bear primarily on the above. These calculations, however, will also include a correlated theoretical study of thermal diffusion, and a theoretical study of screening at metallic interfaces. Studies will be made predominantly for the Mossbauer elements, Au, Sn, Sb, and Fe, as pure metals, in alloys with each other and with other metals. Type II superconducting alloys of the A-15 structure will be investigated by the above methods as a component of this research program.

SUPPORTED BY U.S. National Science Foundation, Div. of Materials Research

8.0024, PROPERTIES OF FLUID HELIUM NEAR CRITICAL POINT
H. MEYER, Duke University, School of Arts & Sciences, *Durham, North Carolina* 27706 (DF046080; AF-AFOSR-3119-77)

AF function - this proposed research primarily falls in the 5.3 research objectives which deal with electrical power for manned and unmanned aircraft, satellites and space stations as well as electrical power for unattended ground-based systems. Research is required in the generation of usable electric power from non-nuclear energy sources, distribution and conditioning of the power and the attendant material requirements. The development of superconductive rotating electrical power generators and pulsed superconductive energy storage systems require that these systems be kept below their normal transition temperature. Deficiency - research is needed in making more efficient heat transport helium systems. As an example of the need, over 90 percent of the system weight of a superconductive energy storage system results from the cryogenic coolant and its storage container. This causes severe weight, volume and reliability penalties in the helium refrigeration systems. It does not appear that high-temperature superconductors (Tc 25 degrees K) will be developed. Objective - the objectives are to study He3-He4 mixtures. Such studies include the determination of the concentration susceptibility in fluid He3-He4 mixtures near the lambda point and the tricritical point, measurement of the singularity of the concentration susceptibility in a fluid He3-He4 mixture near the liquid-vapor critical point, and determination of the asymptotic critical exponents in this same region. Contributions - this research is a part of a comprehensive program in superfluids and superconductors.

In all the experiments outlined in this proposal, the principle of measurement is the same. Two sets of horizontal capacitor plates, each with a capacity of the order of 5 pf, are rigidly mounted one on top of the other in a cell containing the fluid, the separation between the capacitor gaps being about 3 mm. These capacitors are connected on the opposite arms of a bridge circuit or they are measured individually against an empty capacity kept

at the same temperature. In this way the differential as well as the absolute value of the dielectric constant measured by the two capacitors can be observed. The concentration susceptibility is the differential of the molefraction of He3 by the difference in the respective chemical potentials of He3-He4. (Text Abridged)

SUPPORTED BY U.S. Dept. of Defense, Air Force

8.0025, THERMOELECTRIC EFFECTS IN METALS AND ALLOYS

P.L. TAYLOR, Case Western Reserve Univ., Graduate School, *Cleveland, Ohio* 44106 (DMR76-02368)

The effects due to impurity ion recoil and two phonon processes will be incorporated into a theory of thermoelectricity in metals and alloys at low temperatures. A highly simplified initial approach using the Boltzmann equation and a model of free electrons will be extended to include anisotropy and Umklapp scattering. A more basic approach using the Kubo formalism instead of the Boltzmann equation will be undertaken as well.

SUPPORTED BY U.S. National Science Foundation, Div. of Materials Research

8.0026, COLLABORATIVE RESEARCH ON NUCLEAR PHYSICS AT INTERMEDIATE ENERGIES

L.W. SWENSON, Oregon State Higher Educ. Sys., School of Science, *Corvallis, Oregon* 97331 (PHY76-82333)

Experiments will be conducted at the Los Alamos Meson Physics Facility (LAMPF) and at the TRIUMF cyclotron in Vancouver.

At LAMPF, the pion beam will be used to continue studies of particles emitted from the nucleus in coincidence with inelastically scattered pions to try to understand what are the processes which initially occur when pions interact with nuclei. When the high-resolution EPICS spectrometer is completed, studies of elastic and inelastic scattering of positive and negative pions from nuclei will be conducted with special attention to studies of proton and neutron densities in the nuclear surface. Studies of X-rays emitted by muonic atoms will be conducted to obtain information on nuclear shapes in the mass - 190 region. A study will be conducted to measure neutrons and protons emitted in muon capture on nuclei - the proton spectra are expected to give information on the importance of charge-exchange processes at medium energies.

At TRIUMF, a variety of experiments will utilize the special features of that accelerator-polarized protons, energy variability and high duty factor. These will include elastic and inelastic scattering of 200 - 550 MeV protons, proton-proton bremsstrahlung and coincidence studies of muonic atoms.

This work is a continuation of work supported by the Foundation under grant PHY76-19762.

SUPPORTED BY U.S. National Science Foundation, Div. of Physics

8.0027, TRAPS AND DEEP IMPURITIES IN SEMICONDUCTOR JUNCTION STRUCTURES

A.G. MILNES, Carnegie Mellon University, School of Engineering, *Pittsburgh, Pennsylvania* 15213 (DMR74-01425-A01)

The properties of platinum (Pt) as a lifetime control impurity in single-crystal silicon are being explored to establish the effects of temperature, shallow doping density, quenching and other process conditions on minority carrier lifetime. Junction structures will be examined for the effect of platinum on forward voltage drop, junction generation current and reverse voltage rating. The Pt is introduced by diffusion from Pt doped oxide layers. Comparisons are being made with respect to gold (Au) doped and control specimens subject to similar processing. Hole and electron lifetimes are being measured by several techniques including recovery and collection procedures and diffusion length measurements from scanning electron microscope studies.

Similar attention will be given to gadolinium (Gd) as a deep impurity in silicon since this also has been reported as an effective lifetime controller in some devices. The energy levels are unknown and will be determined by Hall measurements. Capture cross sections will be estimated from junction transient capacitance emission studies and from lifetime measurements made as a function of temperature. When this information is available, an attempt will be made to establish the relative merits of Au, Pt, and Gd as lifetime control impurities for various applications. Their properties will be related to what is known of other deep impurities including silver, nickel, rhodium and iridium.

This is a renewal of NSF Grant DMR74-01425.

SUPPORTED BY U.S. National Science Foundation, Div. of Materials Research

8.0028, LABORATORY STUDIES OF ATOMIC COLLISION PROCESSES 14656-P

M.A. BIONDI, Univ. of Pittsburgh, School of Arts & Sciences, *Pittsburgh, Pennsylvania* 15260 (DA0F8927; DAAG29 77 G0079)

To acquire reaction rate data for processes of importance in laser plasmas and to elucidate the nature of the atomic collision processes occurring in plasmas of the type encountered in gas lasers and in the ionosphere. Relevance - the program is relevant to the design of high-power closed-cycle electric carbon dioxide lasers and the Middle Atmospheric Research Program of the Atmospheric Sciences Laboratory.

The magnitudes of the recombination coefficients of complex ions such as CO(plus). CO, CO(plus). H sub 2 O, Xe3(plus), etc., and the variation with electron temperature will be studied over a wide range. The nature of cluster ion recombination processes will be investigated by using optical spectrometric techniques to characterize the final states produced by the recombination events. A drift tube will be used to study both dimer and polar molecule cluster ions and non-resonant charge transfer processes.

ADDENDA: Supporting agency address is: DARCOM Army Research Office, Box 12211, Research Triangle Park, NC 27709

SUPPORTED BY U.S. Dept. of Defense, Army

8.0029, KINETIC INDUCTANCE AND SPECIFIC HEATS OF SUPERCONDUCTORS

D.G. NAUGLE, Texas A & M University System, School of Science, *College Station, Texas* 77843 (DMR75-04364)

An experimental program to study the properties of amorphous superconductors, the proximity effect between superconductors and normal metals, and fluctuation effects in superconductors will be initiated. Measurements of the kinetic inductance in thin superconducting amorphous Bi, Ga, and Pb films will be used to determine the temperature dependence and zero temperature value of the penetration depth in these strong-coupling superconductors for comparison with the predictions of the strong-coupling theory. Specific heats of superconducting amorphous transition-metal foils will be measured with an AC-technique. Interpretation of these measurements will provide information about the electronic and vibrational density of states for these strong-coupling materials. AC-specific heat measurements near the transition temperature for thin films also will be used to study fluctuations of the superconducting order parameter at the phase transition. Two new experimental approaches to study the proximity effect are also proposed. Measurements of the kinetic inductance of thin-film proximity sandwiches will be used to determine the spatial average of the square of the order parameter for dirty superconductors over a wide range of temperature below Tc. AC-specific heat techniques will be used to make the first detailed experimental determination of the thermodynamic properties of thin-film proximity sandwiches for direct comparison with theory. These experiments form an extension of an experimental program initiated under a three-year grant from the U.S. Army Research Office - Durham.

SUPPORTED BY U.S. National Science Foundation, Div. of Materials Research

SPACE SCIENCES

Includes Space Sciences (general); Astronomy; Astrophysics; Lunar and Planetary Exploration; Solar Physics; and Space Radiation. For Related Information See Also Geosciences.

10.0001, GROUND-BASED INFRARED PHOTOMETRY AND MAPPING OF ENERGETIC EXTRAGALACTIC SOURCES

G.H. RIEKE, Univ. of Arizona, Lunar & Planetary Laboratory, *Tucson, Arizona* 85721 (AST76-81874)

The infrared emission of extragalactic sources will be studied through extensive ground-based observations, continuing a program that has resulted in many discoveries in this area. Detailed measurements of the infrared spectra, sizes, and variability will be obtained of the brighter sources, and surveys of fainter sources will be continued to define the general infrared properties of extragalactic objects. More limited research will be carried on in the areas of infrared polarimetry, study of interstellar molecular hydrogen, and far infrared detection techniques.

This action provides additional funding and extends the duration of grant AST 751099 A01 for 12 months.

SUPPORTED BY U.S. National Science Foundation, Div. of Astronomical Sciences

10.0002, SEARCH FOR OTHER PLANETARY SYSTEMS IN THE UNIVERSE

K. SERKOWSKI, Univ. of Arizona, Lunar & Planetary Laboratory, *Tucson, Arizona* 85721

A method of wavelength calibration is proposed which may enable measuring changes in radial velocity of bright solar-type stars to an accuracy of about 5 meters per second. Such accuracy would be sufficient for detecting Jupiter-like planets around these stars. The stellar spectrum is imaged by a slitless echelle spectrograph onto a 100-channel Digicon image tube. Instrumental profiles of Digicon diodes are narrowed down by a Fabry-Perot etalon, making the profiles less dependent on atmospheric seeing. The same etalon, made of zero thermal expansion material and kept in vacuum, provides wavelength calibration for every resolution element in the spectrum. The wavelengths of Fabry-Perot transmission maxima remain fixed and the spectrum is scanned over the 0.6 A free spectral range by the Earth's motion around the sun.

SUPPORTED BY National Geographic Society

10.0003, DETAILED SPECTROSCOPIC STUDIES OF QUASI-STELLAR OBJECTS

P.A. STRITTMATTER, Univ. of Arizona, School of Liberal Arts, *Tucson, Arizona* 85721 (AST76-22991)

Observational (mainly spectroscopic) and theoretical studies of Quasi-stellar Objects (QSOs) will be carried out. Observationally, it is intended to (1) study the distribution of absorption lines to ascertain where the absorption occurs, and to account for the relative velocities of emission and absorbing clouds, (2) to determine abundances in these objects, (3) continue the redshift survey work on Molonglo sources, and (4) carry out a search for BL Lac objects. The theoretical work will concentrate on cloud acceleration mechanisms, especially under the influence of radiation pressure. The impact of the QSO on any ambient material will be investigated.

Continuation of research previously supported by AST71 03434A02.

SUPPORTED BY U.S. National Science Foundation, Div. of Astronomical Sciences

10.0004, TRACE-ELEMENT RADIOGRAPHY, WITH EMPHASIS ON METEORITE STUDIES

D.S. BURNETT, Calif. Inst. of Technology, Graduate School, *Pasadena, California* 91109 (EAR76-84402)

This project concerns a determination of trace element partitioning among mineral phases in meteorites by particle track radiographic methods. Polished sections of meteorites are exposed to the irradiation for a given element while in contact with a dielectric track detector. The particle tracks thus produced allow a mapping of the concentration of that element throughout the sample. Elements whose nuclear properties lend themselves to this approach include uranium, thorium, bismuth, lead, and boron. The sensitivity of this method depends on the element being analyzed and falls in the range 0.01 to 1 part per million, with a spatial resolution of 20 - 50 micrometers.

The study will provide reliable solar system abundances for the actinide elements in meteorites and test predicted mineral sites and abundances for these elements that are based on solar condensation models.

This is a continuation of EAR73-00245A02.

SUPPORTED BY U.S. National Science Foundation, Div. of Earth Sciences

10.0005, THEORETICAL STUDIES OF ENERGETIC PARTICLES IN SOLAR FLARES

H.S. HUDSON, Univ. of California, Graduate School, *San Diego, California* 92037 (AST76-01280 A01)

Renewal of support is for continuation of theoretical study of solar flares. Interactions of highly energetic particles, especially electrons, are believed to produce many of the phenomena observed. In addition to escape of the particles themselves from the sun into the interplanetary medium where they often encounter the earth's atmosphere, they react with the sun's magnetic field in the corona, the outer atmosphere of the sun. Loss of energy in the denser parts of flaring plasma goes mainly into the heating of the plasma to fantastic temperatures. Flare effects are observed over a wide range of wavelengths from microwave radio emission to X-rays.

Past application of a 'thick target' theory of the energetic electron interactions in solar flares has aided understanding of several phenomena, including the white light continuum emission in many major solar flares. The planned research seeks to extend the detailed modeling of the energetic particle-flaring atmosphere interaction to explain other phenomena associated with the flare impulsive phase: formation of the hot region, excitation of shock waves, and emission of electron streams in the short-duration, fast-drift (Type III) bursts of radio energy.

Prior support was NSF grant AST 76-01280.

SUPPORTED BY U.S. National Science Foundation, Div. of Astronomical Sciences

10.0006, GENERAL RELATIVITY AND RELATIVISTIC ASTROPHYSICS

J.B. HARTLE, Univ. of California, School of Letters & Science, *Santa Barbara, California* 93106 (PHY76-08551 A01)

Relativistic gravity plays a central role in the search for explanations of many of today's frontier astrophysical phenomena such as the pulsars, the quasars, the cosmic microwave background radiation, the explosions in galactic nuclei, the galactic X-ray sources and the dynamics of the universe itself. This research is a continuation of work at the University of California, Santa Barbara, initiated under NSF grant PHY74-12146 A01 on the fundamental physics behind such objects.

Three major problem areas are to be covered: 1. Research into the theory of the structure and stability of relativistic stars with a special emphasis on the physics of rapidly rotating objects. 2. Research into the physics of black holes and gravitational collapse, emphasizing especially investigation of the fundamental issues connected with quantum mechanical particle production by black holes. 3. Investigation of techniques for calculating particle production in the early universe and of the possible influence of long-range neutrino forces on the dynamics of the early universe.

SUPPORTED BY U.S. National Science Foundation, Div. of Physics

10.0007, STELLAR PROPER MOTIONS AND PARALLAXES

A.R. KLEMOLA, Univ. of California, Lick Observatory, *Santa Cruz, California* 95060 (AST76-81342)

The study of the motions of stars near the sun and the general pattern of rotation about the center of our galaxy represents an important part of modern astronomy. The renewal support here involves the measurement and analysis of proper motions of stars for about 150 fields on the sky lying outside the zone of avoidance (Milky Way). The motions are determined with reference to distant galaxies which have no appreciable motions. The specific goals of the analyses include: (1) Determination of numerical values for the constants of galactic rotation and possible local

deviations from the smooth pattern; (2) Study of solar motion (secular parallax); (3) Determination of local systematic corrections to the system of proper motions as defined by the basic modern star catalog AGK3 for the northern sky.

It is proposed also to continue measurement and reduction of selected stars of the general trigonometric parallax program from the 100 fields having available photographic plate material at the Lick Observatory. Other efforts include determination of the positions of globular clusters requested by radio astronomers and the positions of nearly three dozen stars recently identified as radio sources to aid in a study of the radio-astronomical and optical reference systems. The mechanical encoders on the survey machine will be replaced with optical encoders.

Prior support was by NSF grant AST 75-19753.

SUPPORTED BY U.S. National Science Foundation, Div. of Astronomical Sciences

10.0008, GAS DYNAMICS OF INTERSTELLAR SPACE AND X-RAY STARS

R.A. MCCRAY, Univ. of Colorado, School of Arts & Sciences, *Boulder, Colorado* 80302 (AST75-23590 A01)

Theoretical studies will be made of the interaction of hot stars with the interstellar medium, and of the associated ionization balance and emission spectrum. Data from optical and ultraviolet satellite observations will be interpreted in the light of these models. Theoretical models will be developed to interpret observations of infrared emissions from hydrogen molecules.

A broad-based program for studying the interaction of X-ray sources with associated gas flows will be continued. Detailed calculations and predictions of X-ray, optical and ultraviolet spectral emission and absorption will be made and compared with observations. The influence of the X-rays on the dynamics of the gas flows will be studied.

This is a continuation of work previously supported by NSF grant AST75-23590.

SUPPORTED BY U.S. National Science Foundation, Div. of Astronomical Sciences

10.0009, INFRARED AND OPTICAL PHOTOMETRY PROGRAMS AT LAS CAMPANAS OBSERVATORY

S.E. PERSSON, Carnegie Inst. of Washington, *Washington, District of Columbia* 20005 (AST76-22676)

A photometric system suitable for use in the infrared spectral region will be completed for use on the 2.5 meter telescope at the Las Campanas Observatory in Chile. The photometer will be completed and several filter systems will be provided including a circular variable filter for spectrophotometry. Infrared detectors and a data recording system will be provided.

The initial observational projects to be carried out with this instrument will include: 1. The extension of previous work on the stellar content of galaxies by means of recording and analyzing the distribution of energy as a function of wavelength in the red and infrared spectral regions. Particular attention will be paid to determining the fraction of heavy metals in the stars. 2. Southern hemisphere gaseous nebulae will be observed. Protostars will be located and their characteristics will be studied.

SUPPORTED BY U.S. National Science Foundation, Div. of Astronomical Sciences

10.0010, RESEARCH WITH A PHOTON-COUNTING IMAGE INTENSIFIER SPECTROMETER AT THE LAS CAMPANAS OBSERVATORY

L. SEARLE, Carnegie Inst. of Washington, *Washington, District of Columbia* 20005 (AST76-20839)

The 2.5 meter DuPont telescope at the Las Campanas Observatory will go into operation this year. It will be equipped with a large Cassegrain spectrograph, a television system for acquisition of faint objects, and the rudiment of a photon-counting image intensifier detector system. This system will be upgraded to the point where it may be used routinely for observational programs by all staff members.

The first program to be done is an investigation of the stellar content of star clusters in the Magellanic Clouds in order to determine the distribution of the age and chemical composition of these subsystems and to assess their significance to the chemical and dynamical evolution of galaxies. The second program is a radial velocity survey of galaxies brighter than sixteenth magnitude in the Zwicky catalog in order to investigate the structure of galaxy clustering in velocity space and to map the extent of the perturbation of the velocity field around rich clusters of galaxies.

SUPPORTED BY U.S. National Science Foundation, Div. of Astronomical Sciences

10.0011, ASTROPHYSICAL APPLICATIONS OF MICROSCOPIC MANY-BODY THEORY

D. PINES, Univ. of Illinois, School of Liberal Arts & Sci., *Urbana, Illinois* 61801 (PHY75-08790 A02)

Research initiated under NSF grant GP-37485X1 will continue. Specific topics in theoretical astrophysics to be investigated include: 1. fundamental studies of matter at high density; 2. dynamic processes in neutron stars and planets; 3. physical processes in compact X-ray sources; 4. transport processes in magnetic white dwarf envelopes; 5. plasma astrophysics; 6. cosmic X-ray bursts; and 7. pulsar radiation mechanisms.

SUPPORTED BY U.S. National Science Foundation, Div. of Physics

10.0012, FAINT PHOTOELECTRIC PHOTOMETRIC STANDARD STAR SEQUENCES

A.U. LANDOLT, Louisiana State Univ. Systems, School of Science, *Baton Rouge, Louisiana* 70803 (DF047270; AF-AFOSR-3218-77)

AF function - reconnaissance and surveillance of spacecraft. Deficiency - lack of photometric calibration of faint stars to verify detection performance of optical surveillance systems. Objective - to establish photometric standards for stars in magnitude interval 12 and 17 over as wide a range of color index as possible. Contribution - faint standard stars will permit the calibration of detectors now in use or under development.

UBV (ultraviolet, blue, visual) photoelectric photometric standard star sequences will be established in eight selected areas along the celestial equator. Additional sequences will be established in known regions of the sky at 2.5 hour intervals in right ascension at -45 degrees declination.

ADDENDA: Supporting agency address is: AF Office of Scientific Research NP, Bldg 410, Bolling AFB, DC 20332

SUPPORTED BY U.S. Dept. of Defense, Air Force

10.0013, THEORETICAL RESEARCH IN COSMOLOGY AND RELATIVITY

D.R. BRILL, Univ. of Maryland, School of Arts & Sciences, *College Park, Maryland* 20742 (PHY77-05299)

Research will be carried out on problems in general relativity and cosmology. These problems include: (a) Mathematical and physical properties of maximal surfaces and of surfaces of constant mean curvature, (b) general properties of relativistic stars, (c) numerical integration of Einstein's equations.

This work represents a continuation of that currently supported by Foundation grant PHY70-02077 AO5.

SUPPORTED BY U.S. National Science Foundation, Div. of Physics

10.0014, ABSORPTION OF RADIATION BY MOLECULAR OXYGEN

A. DALGARNO, Harvard University, Harvard College Observatory, *Cambridge, Massachusetts* 02138 (ATM76-23998)

This grant funds theoretical atmospheric research in two areas. One is an attempt to predict the extreme ultraviolet emission spectrum of the atmosphere of any one of the planets Earth, Mars and Venus and to explore the consequences on the ionization structure. The second category is the use of quantum mechanics to calculate the rate coefficients of reactions that are significant in atmospheric chemistry. Included in the study are the calculation of the absorption of ultraviolet radiation by molecular oxygen to the repulsive 3 pi state, the calculation of the reaction

paths for dissociative recombination of u O2 ion and the calculation of the Penning ionization of atomic oxygen by metastable helium. The study includes a general analysis of the role of Rydberg states that may also have atmospheric significance. This work continues work done on an earlier grant, ATM-7421688.

SUPPORTED BY U.S. National Science Foundation, Div. of Atmospheric Sciences

10.0015, RADAR TESTS OF GENERAL RELATIVITY
G.H. PETTENGILL, Mass. Inst. of Technology, School of Science, *Cambridge, Massachusetts* 02139 (PHY72-05104 A04)

Research initiated under NSF grant PHY72-05104 A02 will be continued. This program in gravitational physics will explore radar echo data to determine: 1) the precise gravitational retardation of the travel times of electromagnetic signals passing near the sun; 2) the amount of the non-Newtonian advances of the perihelion of the inner planets; 3) the degree of constancy of the gravitational 'constant'; 4) the degree to which the Principle of Equivalence is valid for massive bodies.

SUPPORTED BY U.S. National Science Foundation, Div. of Physics

10.0016, SPECTRAL DIAGNOSTICS FOR TURBULENT ELECTRIC FIELDS IN SOLAR FLARES
P.M. BAKSHI, Boston College, School of Arts & Sciences, *Chestnut Hill, Massachusetts* 02167 (INT76-21090)

This joint project will endeavor to provide an observational test of the existence of turbulent electric fields in the flare region of solar flares.

A high level of electrostatic turbulence can be generated by plasma instabilities in solar flares. The turbulence, in general, has both quasistatic (ionic) and dynamic (electronic) components. Hydrogenic line profiles develop distinct features under the simultaneous effect of quasistatic and dynamic turbulent electric fields. Possible inferences can be drawn regarding the nature of the turbulent electric fields in the flare region. A detailed determination of the characteristics of these fields would help in identifying the underlying plasma instability mechanisms that give rise to these fields during the flare build-up and associated processes.

The specific long-range objectives are: (1) further development of new, non-perturbative theory of hydrogenic spectra in turbulent plasmas, (2) work out a detailed plasma spectroscopic and solar diagnostic application of the theory, (3) development of a solar observational program aimed at determining the level of plasma turbulence and its effect on Stark-broadened and Zeeman-split spectra, and (4) study possible plasma instability mechanisms.

SUPPORTED BY U.S. National Science Foundation, Div. of International Programs

10.0017, DEVELOPMENT OF A FAST FOURIER TRANSFORM SPECTROMETER FOR RADIO ASTRONOMY
I.R. LINSCOTT, Dudley Observatory, *Albany, New York* 12208 (AST75-23394 A01)

Currently our knowledge of possible sources of pulsed microwave radiation is limited to the volume of space very near the earth. The density of electrons in space is sufficient to smear out or disperse the pulse until after a relatively short distance the pulse becomes undetectable. The pulsars are a prime example of this. To detect pulsars at great distances or behind interstellar gas clouds, special signal processing must be done. Even so, the fine detail of the pulses has not been fully resolved and the pulsing mechanism is still unknown.

A new approach to solving this problem will be made by developing and constructing special Fast Fourier Transform Spectrometer. Utilizing newly developed integrated circuit chips, this machine will perform both as a spectrometer and a real-time dispersion removal instrument providing up to a 100-fold improvement in pulse detectivity over current instruments. Upon completion the instrument will be tested on the Dudley Observatory 100-foot radio telescope and used to examine small-scale structure in pulsar pulses, study pulsar emission mechanism and to search for supernova events and other possible radio bursts.

This is a continuation of work supported under NSF grant AST 75-23394.

SUPPORTED BY U.S. National Science Foundation, Div. of Astronomical Sciences

10.0018, FIELD SEARCH FOR METEORITES, MCMURDO ICE-FREE AREA
W.A. CASSIDY, Univ. of Pittsburgh, School of Arts & Sciences, *Pittsburgh, Pennsylvania* 15260 (DPP76-10800 A01)

The University of Pittsburgh will continue to investigate areas of glacial ablation, moraines, and other areas of accumulation in Antarctica for meteorites. The Japanese Antarctic Expeditions have found very large numbers of meteorites in areas of glacial ablation near the Yamato Mountains of East Antarctica. Dr. William Cassidy of the University of Pittsburgh will investigate similar areas of potential meteorite accumulation in the McMurdo area of Antarctica. The goal of this project is to better understand the depletion areas of continental ice caps and to search for meteorites that may have fallen on the Antarctic Ice Cap in the past.

Two University of Pittsburgh scientists will do field research in the McMurdo area, Antarctica, during the 1977-78 summer season.

SUPPORTED BY U.S. National Science Foundation, Div. of Polar Programs

10.0019, EARTH ROTATION FROM LASER LUNAR DISTANCE RANGING
J.D. MULHOLLAND, Univ. of Texas, School of Natural Sciences, *Austin, Texas* 78712 (DN675310; N00014-76-C-0641)

For reasons of navigation and accurate missile trajectory prediction, Navy must both know intercontinental distances accurately and eliminate errors in geoidal shape due to irregularities in the earth's rotation. This research will use data obtained from lunar laser-ranging experiments (in which distances to the moon are determined using laser beams returned from corner reflectors implanted on the moon by U.S. astronauts) to improve our knowledge of both intercontinental distances and earth rotational behavior.

The contractor will emphasize two tasks: one, to determine the best distribution of observation stations to produce the most precise values of universal time and polar motion; and the second, to develop and apply computer techniques for reducing the data to yield universal time and polar motions precisely.

ADDENDA: Supporting agency address is: Office of Naval Research, Arlington, VA 22217

SUPPORTED BY U.S. Dept. of Defense, Navy

10.0020, ASTROPHYSICAL GAS-GRAIN SYSTEMS
J.M. SCALO, Univ. of Texas, School of Natural Sciences, *Austin, Texas* 78712 (AST76-20258)

This proposal will support a study of the behavior and evolution of astrophysical gas-grain systems. The research will consist of: (1) the development of a theoretical basis for the study of gas-grain systems, and the development of an efficient and accurate method for the treatment of radiative transfer; and (2) the application of this work to problems such as circumstellar shells around evolved stars, dense interstellar dust clouds, novae, and supernovae. In these applications emphasis will be placed on the calculation of theoretical grain size distributions and on the processes controlling the size distribution of the grains.

SUPPORTED BY U.S. National Science Foundation, Div. of Astronomical Sciences

10.0021, RADIATION, CURVED SPACETIMES AND QUANTUM GEOMETRODYNAMICS
K.V. KUCHAR, Utah Higher Education System, School of Science, *Salt Lake City, Utah* 84112 (PHY74-16311 A04)

Theoretical research in gravitation initiated under NSF grant number MPS74-16311 AO1 will be continued. Theoretical topics to be investigated include: Relativistic Astrophysics: 1. Radiation from Rotating Collapsing Star; 2. X-ray Accretion Disk Problems;

3. Relativistic Fluid Disks; 4. Gravitational Collapse in the Brans-Dicke Theory; 5. Self-Gravitating Fluid Spheroids; 6. Collapse to a Toroidal Singularity; 7. The Optical Appearance of the External World to an Observer Falling into a Kerr Black Hole. Quantum Gravity: 1. Gravitational Collapse and Quantization; 2. Hyperspace and Quantum Field Theory in Curved Spacetimes; 3. Factor Ordering in Geometrodynamics; 4. Geometrical Quantization; 5. Manifold Structure of Hyperspace; 6. Linearization Stability; 7. Geodesic Completeness and Global Cauchy Hypersurface.

SUPPORTED BY U.S. National Science Foundation, Div. of Physics

10.0022, PARALLAXES AND PROPER MOTIONS OF STARS

L.W. FREDRICK, Univ. of Virginia, School of Arts & Sciences, *Charlottesville, Virginia* 22903 (AST75-14345 A02)

Under a 17-month continuing grant, astrometric programs at the McCormick Observatory are being continued and a new program in the southern skies carried out at Mt. Stromlo, Australia, in cooperation with the Australian National University. Parallaxes and proper motions of nearby stars are important in furnishing distances and motions which permit deriving the true luminosity and, with other data, the masses of stars in double star systems, contributing to knowledge of the sun's neighbors. Motions also furnish data for understanding the structure of our Milky Way galaxy. Astrometric measures furnish the yardstick for calibration of the cosmic distance scale. During the first five months, the Virginia astronomers have completed observations and carried out reductions for parallax of an additional 20 stars, including 5 members of the Hyades cluster. A parallax series on the optical object in the position of the radio source 3C273 will be completed and reduced, and positions of other radio sources found. Optical positions will be compared with radio positions. Following initial parallax observations at Mt. Stromlo, a second observing run will be carried out June to November, 1977. Plates will be returned to Virginia for measurement and reduction. Early plates with the Mt. Stromlo telescope will be repeated for proper motions of much neglected southern stars.

Prior support was by NSF grant AST 75-14345 A01.

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VOLUME 15 NUMBER 21 / NOVEMBER 8, 1977

Scientific and Technical Aerospace Reports

A Semimonthly Publication of the National Aeronautics and Space Administration

01 AERONAUTICS (GENERAL)

N77-30065*# Amerind Publishing Co. Pvt. Ltd., New Delhi (India).
SOVIET AIRCRAFT AND ROCKETS
N. A. Zhemchuzhin, M. A. Levin, I. A. Merkulov, V. I. Naumov, O. A. Pozhidayev, S. P. Frolov, and V. S. Frolov 1977 277 p Transl. into ENGLISH of the book "Znakomtes, samolet i raketa" Moscow, Transport Publishers, 1971 Sponsored by NASA (NASA-TT-F-770; TT-74-52007) Avail: NTIS HC A13/MF A01 CSCL 01A

An overview of Soviet development and accomplishments in aeronautics and astronautics is presented along an assessment of the technologies required for aircraft or rocket flight. For individual titles, see N77-30066 through N77-30072.

N77-30066*# Amerind Publishing Co. Pvt. Ltd., New Delhi (India).
IN HERCULEAN FLIGHT
In its Soviet Aircraft and Rockets (NASA-TT-F-770) 1977 p 1-12 Transl. into ENGLISH from the book "Znakomtes, samolet i raketa" Moscow, Transport Publishers, 1971 (For primary document see N77-30065 21-01)
Avail: NTIS HC A13/MF A01 CSCL 01A

Major developments in the history of Soviet aviation are summarized and the objectives and accomplishments of various manned and unmanned space flight programs are discussed. A.R.H.

N77-30067*# Amerind Publishing Co. Pvt. Ltd., New Delhi (India).
AIRCRAFT **c02**
In its Soviet Aircraft and Rockets (NASA-TT-F-770) 1977 p 24-80 Transl. into ENGLISH from the book "Zankomtes, samolet i raketa" Moscow, Transport Publishers, 1971 (For primary document see N77-30065 21-01)
Avail: NTIS HC A13/MF A01 CSCL 01A

The physical principles of flight, and the consideration of atmospheric composition and aerodynamic forces in the design and construction of various types of aircraft are discussed. Flight characteristics are described for helicopters, rotary-wing aircraft, short and vertical takeoff aircraft, and tailess or variable geometry wing aircraft. Flow characteristics at various speeds are also discussed. A.R.H.

N77-30068*# Amerind Publishing Co. Pvt. Ltd., New Delhi (India).
AIRCRAFT ENGINES **c07**
In its Soviet Aircraft and Rockets (NASA-TT-F-770) 1977 p 81-139 Transl. into ENGLISH from the book "Znakomtes, samolet i raketa" Moscow, Transport Publishers, 1971 (For primary document see N77-30065 21-01)
Avail: NTIS HC A13/MF A01 CSCL 21E

Thrust and weight requirements of aircraft engines in general are discussed. The characteristics and operating principles of various types of air breathing and rocket engines are described. A.R.H.

N77-30069*# Amerind Publishing Co. Pvt. Ltd., New Delhi (India).
AIRCRAFT EQUIPMENT **c06**
In its Soviet Aircraft and Rockets (NASA-TT-F-770) 1977 p 140-157 Transl. into ENGLISH from the book "Znakomtes, samolet i raketa" Moscow, Transport Publisher, 1971 (For primary document see N77-30065 21-01)
Avail: NTIS HC A13/MF A01 CSCL 01D

The complex of functionally interconnected instruments and devices for controlling flight, engine operations, electrical systems, communications, and vital systems for passengers and crew is described. The aggregates of the aircraft automatic equipment are also discussed. A.R.H.

N77-30070*# Amerind Publishing Co. Pvt. Ltd., New Delhi (India).
INSTRUMENTS AND METHOD OF AIR NAVIGATION **c04**
In its Soviet Aircraft and Rockets (NASA-TT-F-770) 1977 p 158-177 Transl. into ENGLISH from the book "Znakomtes, samolet i raketa" Moscow, Transport Publishers, 1971 (For primary document see N77-30065 21-01)
Avail: NTIS HC A13/MF A01 CSCL 17G

Topics discussed include magnetic and astronavigation instruments; flight beyond ground visibility; aircraft radio navigation instruments and communication radio sets; instrument landing systems; and ground controlled landing systems. A.R.H.

N77-30071*# Amerind Publishing Co. Pvt. Ltd., New Delhi (India).
AIRCRAFT CYBERNETICS **c08**
In its Soviet Aircraft and Rockets (NASA-TT-F-770) 1977 p 178-197 Transl. into ENGLISH from the book "Znakomtes, samolet i raketa" Moscow, Transport Publishers, 1971 (For primary document see N77-30065 21-01)
Avail: NTIS HC A13/MF A01 CSCL 01C

The use of computers for aircraft control, flight simulation, and inertial navigation is explored. The man-machine relation problem in aviation is addressed. Simple and self-adapting autopilots are described and the assets and liabilities of digital navigation techniques are assessed. A.R.H.

N77-30072*# Amerind Publishing Co. Pvt. Ltd., New Delhi (India).
ASTRONAUTICS **c12**
In its Soviet Aircraft and Rockets (NASA-TT-F-770) 1977 p 198-271 Transl. into ENGLISH from the book "Znakomtes, samolet i raketa" Moscow, Transport Publishers, 1971 (For primary document see N77-30065 21-01)
Avail: NTIS HC A13/MF A01 CSCL 22A

Principles of rocket engineering, flight dynamics, and trajectories are discussed in this summary of Soviet rocket development and technology. Topics include rocket engine design, propellants, propulsive efficiency, and capabilities required for orbital launch. The design of the RD 107, 108, 119, and 214 rocket engines and their uses in various satellite launches are

described. NASA's Saturn 5 and Atlas Agena launch vehicles are used to illustrate the requirements of multistage rockets.
A.R.H.

N77-30073# Army Aviation Systems Command, St. Louis, Mo. Systems Analysis Office.
FLYING, MAINTENANCE, AND THE SALE OF PARTS TO THE FIELD: INTERACTIVE MODELS FOR AH-1 AND CH-47 SYSTEMS Final Report
Valentin C. Berger and Blaine T. Stone Apr. 1977 61 p refs (AD-A039193; DRSAV-D-77-6; USAVSCOM-TR-77-24) Avail: NTIS HC A04/MF A01 CSCL 01/3

Computer-generated graphic displays are used to investigate the relationships of AH-1 and CH-47 fleet flying hours, and of maintenance occurences of short and long duration during selected peacetime and wartime (RVN) periods. The rationale for observed relationships is explored in detail, and the discussion is supported with the results of correlation analyses. A similar approach is used to explore the relationships existing between monthly gross sales of stock-funded airframe parts to the field and the number of short and long duration maintenance events, and between those sales and monthly fleet flying hours. The AH-1 and CH-47 fleets are examined during a peacetime period of 1-1/2 fiscal years. The two elements of the study are shown to be complementary and suitable for the construction of interactive models of operations and supply support. A probable connection is postulated between managed field maintenance support activities and the cost-effectiveness of On Condition Maintenance (OCM) world-wide team visits. GRA

N77-30074# Battelle Columbus Labs., Ohio.
ARMY AVIATION MANUFACTURING TECHNOLOGY PROGRAM GUIDANCE Final Report, 1 Feb. 1975 - 17 May 1976
H. J. Henning and T. G. Byrer Jun. 1976 156 p refs (Contract DAAJ01-75-C-0448)
(AD-A040821; DRSAV-76-30) Avail: NTIS HC A08/MF A01 CSCL 01/3

This program is aimed at formulating a realistic five year plan for developing and implementing advanced manufacturing technologies to the production of Army helicopters and recommending modifications in the operation of the Army Aviation Manufacturing Technology program to realistically accommodate the plan. Author (GRA)

02 AERODYNAMICS

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

For related information see also *34 Fluid Mechanics and Heat Transfer.*

N77-30075 Iowa State Univ. of Science and Technology, Ames.
LABORATORY SIMULATION OF A TORNADO-LIKE VORTEX BOUNDARY LAYER INTERACTION Ph.D. Thesis
Behrooz Fattahi 1976 228 p
Avail: Univ. Microfilms Order No. 77-10314

In view of the failure of the conventional methods of tornado vortex simulation to satisfactorily explain the mechanism of the boundary layer interaction of such vortices, a unique approach to generate a tornado-like vortex in the laboratory was employed. The modeling emphasizes the importance of the interaction of a mesoscale atmospheric circulation (tornado cyclone) with the earth's surface leading to the formation of a concentrated microscale circulation (tornado vortex). Except for introducing angular momentum from upper levels, no upward suction is superimposed on the flow field by artificial means. Based on observations and experimental measurements made during the course of the investigation, the mechanism of the formation of a tornado vortex and its associated downmoving funnel is discussed. Dissert. Abstr.

N77-30076 Maryland Univ., College Park.
AN EXPERIMENTAL INVESTIGATION OF THE NEAR-WALL REGION OF A THREE-DIMENSIONAL INCOMPRESSIBLE TURBULENT BOUNDARY LAYER RELAXING IN A ZERO PRESSURE GRADIENT Ph.D. Thesis
Kattingeri Sheshagiri Hebbar 1976 302 p
Avail: Univ. Microfilms Order No. 77-9513

The near wall region of a three dimensional turbulent air boundary layer, relaxing in a nominally zero external pressure gradient, was examined. Measurements were made at selected locations with a traversing mechanism that was externally mounted on the test wall. Data indicated that the apparent dimensionless velocity profiles in the viscous sublayer region are universal and that the wall influence is negligible beyond $y+ = 5$.
Dissert. Abstr.

N77-30077 Tennessee Univ., Knoxville.
AN INVESTIGATION OF THE AERODYNAMIC CHARACTERISTICS OF VENTILATED TEST SECTION WALLS FOR TRANSONIC WIND TUNNELS Ph.D. Thesis
James Laverne Jacocks 1976 87 p
Avail: Univ. Microfilms Order No. 77-10777

Static pressure measurements made at the boundaries of a two-dimensional flow yield sufficient information for calculation of the remaining parameters of interest. The interior flow is assumed to be compatible with the small-perturbation, transonic potential equation and solutions are obtained using finite difference techniques. The resulting flow angle distribution in the vicinity of the ventilated wall then allows computation of the turbulent boundary development on, and mass flux distribution through the ventilated wall. The accuracy of the procedure is demonstrated by comparison of results with independent laser velocimetry perforated and longitudinally slotted walls.
Dissert. Abstr.

N77-30078 Iowa State Univ. of Science and Technology, Ames.
EFFECTS OF REYNOLDS NUMBER AND CORNER RADIUS ON TWO-DIMENSIONAL FLOW AROUND OCTAGONAL, DODECAGONAL AND HEXDECAGONAL CYLINDERS Ph.D. Thesis
William David James 1976 237 p
Avail: Univ. Microfilms Order No. 77-10321

The effects of Reynolds number and corner radius on two-dimensional flow around octagonal, dodecagonal and hexdecagonal cylinders were investigated. All models were studied at three model relative wind orientations to determine the effect of angular alignment. It was found that the greatest drag coefficient was experienced with one of the corners pointing directly into the relative wind. Dissert. Abstr.

N77-30079 Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
NUMERICAL SOLUTION OF THE CONICALLY SYMMETRIC NAVIER-STOKES EQUATIONS FOR HYPERSONIC FLOW AT ANGLE OF ATTACK Ph.D. Thesis
David Scott McRae 1976 113 p
Avail: Univ. Microfilms Order No. 77-9475

Solutions were obtained for hypersonic flow over sharp cones at high angle of attack by integrating the Navier-Stokes equations subject to a conical symmetry assumption. A physically based technique (normal stress damping) was demonstrated for controlling starting transients and for reducing or eliminating numerical oscillations occuring at shock discontinuties during the integration. The general features which appeared in experiment were shown to appear in the results of the integration, including the proper behavior, in laminar flow, of the viscous layer and the vortical singularity. The adequacy of the conical symmetry assumption is indicated for the turbulent regime on conical bodies. Dissert. Abstr.

N77-30080 Colorado Univ., Boulder.
FINAL PERIOD OF DECAY OF AN AXISYMMETRIC TURBULENT VELOCITY AND TEMPERATURE WAKE Ph.D. Thesis
Asadollah Firooz Allahdadi 1976 93 p
Avail: Univ. Microfilms Order No. 77-11281

Results for an axisymmetric turbulent wake were obtained. The elementary solutions governing the fluctuating velocity of a non zero momentum field are derived in detail and the asymptotic expressions for the correlations of the fluctuating velocity components in the final period of decay were obtained. It is

shown that profiles of the energy across the wake based on these elementary solutions display a bell shape structure, contrary to the two maxima profile for fluctuating field with zero momentum. It is also shown that, within the asymptotic theory, the temporally and spatially decaying configurations of the temperature wake are equivalent and related by the Galilean transformation. Dissert. Abstr.

N77-30081# Nagoya Univ. (Japan). Dept. of Aeronautical Engineering.

PARALLEL-SOURCE CORRESPONDENCE IN THE HYPERSONIC SLENDER BODY THEORY

M. Yasuhara and T. Nakajima 1 Aug. 1977 22 p refs Backup document for AIAA Synoptic scheduled for publication in AIAA Journal in Dec. 1977

Avail: NTIS HC A02/MF A01

General one-to-one correspondence relations between parallel and source flows are derived in the hypersonic slender body theory for the case in which the ratio of the specific heats gamma of a gas is equal to 2. The equations of motion and the boundary conditions are shown to be the same for both flows in the transformed, unified coordinates and flow variables. In particular, it is shown that if the pressure coefficient C sub P along the body surface is not too sensitive to the difference of gamma then C sub P in the parallel and in the source flows with different values of gamma can be correlated with each other by a simple conversion relation. Theoretical pressure distributions obtained by applying the present correspondence analogy for several bodies are compared with experimental results, showing good comparisons for power-law bodies, and some differences for a hemisphere cylinder. Author

N77-30082*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

AERODYNAMIC CHARACTERISTICS OF A CANARD-CONTROLLED MISSILE AT MACH NUMBERS OF 1.5 AND 2.0.

Donald L. Kassner and Brian Wettlaufer (ARO, Inc., Moffett Field, Calif.) Jul. 1977 289 p refs

(NASA-TM-X-73219; A-6957) Avail: NTIS HC A13/MF A01 CSCL 01A

A typical missile model with nose mounted canards and cruciform tail surfaces was tested in the Ames 6- by 6-Foot Wind Tunnel to determine the contributions of the component aerodynamic surfaces to the static aerodynamic characteristics at Mach numbers of 1.5 and 2.0 and Reynolds number of 1 million based on body diameter. Data were obtained at angles of attack ranging from -3 deg to 12 deg for various stages of model build-up (i.e., with and without canard and/or tail surfaces). Results were obtained both with the model unrolled and rolled 45 deg. For the canard and tail arrangements investigated, the model was trimmable at angles of attack up to about 10 deg with canard deflections of 9 deg. Also, the tail arrangements studied provided ample pitch stability. there were no appreciable effects of model roll orientation. Author

N77-30083*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

EFFECTS OF CANARD LOCATION ON THE AERODYNAMIC CHARACTERISTICS OF A BLUNT-NOSED MISSILE AT MACH NUMBERS OF 1.5 AND 2.0

Donald L. Kassner and Brian Wettlaufer (ARO, Inc., Moffett Field, Calif.) Jul. 1977 281 p refs

(NASA-TM-X-73220; A-6958) Avail: NTIS HC A13/MF A01 CSCL 01A

A blunt-nosed missile model with nose-mounted canards and cruciform tail surfaces was tested in the Ames 6 by 6-Foot Wind Tunnel to determine the contributions of the component aerodynamic surfaces to the static aerodynamic characteristics at Mach numbers of 1.5 and 2.0 and Reynolds number of 1 million based on body diameter. Data were obtained at angles of attack ranging from -3 deg to 12 deg and canard-deflection angles from -3 deg to 15 deg for various stages of model build-up (i.e., with and without canard and/or tail surfaces). Results were obtained with the canards at two different nose locations. For the canard and tail arrangements investigated, the model was trimmable at angles of attack up to about 4 deg or 5 deg with canard deflections of 9 deg. For this blunt-nosed model, there was little effect of canard location on trim angle of attack. The tail arrangements studied provided ample pitch stability. Author

N77-30084*# Kansas Univ. Center for Research, Inc., Lawrence. Flight Research Lab.

CALCULATION OF LATERAL-DIRECTIONAL STABILITY DERIVATIVES FOR WING-BODY COMBINATIONS WITH AND WITHOUT JET-INTERACTION EFFECTS

C. Edward Lan Aug. 1977 74 p refs

(Grant NsG-1139)

(NASA-CR-154287; CRINC-FRL-281-1) Avail: NTIS HC A04/MF A01 CSCL 01A

A theoretical method is presented for predicting the lateral-directional stability derivatives of wing-body combinations with or without the blowing jet effect. The fuselage effect is accounted for by the axial distribution of vortex multiplets. Comparison of the predicted results with experiments and other theoretical methods show good agreement for configurations without the blowing jet. More applicable experimental data with blowing jets are needed to establish the accuracy of the theory. Author

N77-30085*# Old Dominion Univ. Research Foundation, Norfolk, Va.

EXPERIMENT AND ANALYSIS ON THE FLOW PROCESS DYNAMICS OF THE NASA-LANGLEY EIGHT FOOT TRANSONIC PRESSURE TUNNEL Semiannual Progress Report, 1 May 1976 - 28 Feb. 1977

Ping Tcheng (Old Dominion Univ.) 28 Feb. 1977 39 p

(Grant NsG-1079)

(NASA-CR-154806) Avail: NTIS HC A03/MF A01 CSCL 01A

A dynamic response test performed in a eight foot transonic pressure tunnel is described. The dynamics of the flow process of the wind tunnel at transonic conditions were obtained. Descriptions of the test conditions, instrumentation, presentation of raw data, analysis of data, and finally, based on experimental evidences, an attempt to construct an input output relationship of the flow process from the viewpoints of control engineering are included. Author

N77-30086*# Flow Research, Inc., Kent, Wash.

STUDY OF DESIGN AND ANALYSIS METHODS FOR TRANSONIC FLOW Final Report

Earll M. Murman Jul. 1977 14 p refs

(Contract NAS2-8847)

(NASA-CR-152041; NOTE-118) Avail: NTIS HC A02/MF A01 CSCL 01A

An airfoil design program and a boundary layer analysis were developed. Boundary conditions were derived for ventilated transonic wind tunnels and performing transonic windtunnel wall calculations. A computational procedure for rotational transonic flow in engine inlet throats was formumated. Results and conclusions are summarized. Author

N77-30087# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Cologne (West Germany).

EXPERIMENTAL INVESTIGATION CONCERNING THE REDUCTION OF WAVE DRAG OF POINTED SYMMETRICAL WINGS OF EQUAL VOLUME WITH SUBSONIC LEADING EDGE AND BELL-SHAPED PLANFORM FOR DIFFERENT THICKNESS DISTRIBUTIONS IN THE SPANWISE AND CHORDWISE DIRECTIONS

Friedrich Keunes 15 Sep. 1975 38 p refs In GERMAN; ENGLISH summary Translation was announced as N76-30175 (DLR-FB-75-62) Avail: NTIS HC A03/MF A01; DFVLR, Cologne DM 15.40

Drag measurements were made for a family of wings in a 30 by 30 sq cm supersonic wind tunnel to test the theory that zero lift wave drag for pointed symmetrical wings of finite thickness and equal volume may be reduced by varying the wing planform and the chordwise and spanwise thickness distribution. Because of the influence of the model support and the approximate estimate of the skin friction necessary for determining the wave drag, no agreement was found with the theory, which is valid for the wave drag of wings only. The flow behavior during the tests indicate that the shock wave boundary layer interaction must be considered. Author

N77-30088*# Boeing Vertol Co., Philadelphia, Pa.
COMPARISON OF DYNAMIC STALL PHENOMENA FOR PITCHING AND VERTICAL TRANSLATION MOTIONS Final Report
T. Fukushima and L. U. Dadone Washington NASA Jul. 1977 184 p refs Sponsored in part by US Army
(Contract NAS1-14056)
(NASA-CR-2793; D238-10007-1) Avail: NTIS HC A09/MF A01 CSCL 01A

Test data for vertical translation motions of the V0012 and V23010-1.58 airfoils were compared with force pitch and oscillation data to determine qualitative differences in dynamic stall behavior. Chordwise differential pressure variations were examined in detail for the test conditions displaying dynamic stall. The comparison revealed a number of differences both in the onset of stall and in the progression separation as a function of the type of motion. The evidence of secondary stall events following the recovery from initial stall were found to be dependent on the type of motion, but additional data will be needed to incorporate vertical translation effects into the empirical approximation of dynamic stall. Author

N77-30089*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
COLD AIR PERFORMANCE OF A 12.766-CENTIMETER-TIP-DIAMETER AXIAL-FLOW COOLED TURBINE. 2: EFFECT OF AIR EJECTION ON TURBINE PERFORMANCE
Jeffrey E. Haas and Milton G. Kofskey Aug. 1977 37 p refs Prepared in cooperation with Army Air Mobility Res. and Develop. Lab., Cleveland
(NASA-TP-1018) Avail: NTIS HC A03/MF A01 CSCL 21E

An air cooled version of a single-stage, axial-flow turbine was investigated to determine aerodynamic performance with and without air ejection from the stator and rotor blades surfaces to simulate the effect of cooling air discharge. Air ejection rate was varied from 0 to 10 percent of turbine mass flow for both the stator and the rotor. A primary-to-air ejection temperature ratio of about 1 was maintained. Author

N77-30090*# Sikorsky Aircraft, Stratford, Conn.
MEASUREMENT OF VORTEX VELOCITIES OVER A WIDE RANGE OF VORTEX AGE, DOWNSTREAM DISTANCE AND FREE STREAM VELOCITY
James B. Rorke and Robert C. Moffett Jul. 1977 122 p refs
(Contract NAS1-13765)
(NASA-CR-145213; SER-50991) Avail: NTIS HC A06/MF A01 CSCL 01A

A wind tunnel test was conducted to obtain vortex velocity signatures over a wide parameter range encompassing the data conditions of several previous researchers while maintaining a common instrumentation and test facility. The generating wing panel was configured with both a revolved airfoil tip shape and a square tip shape and had a semispan aspect of 4.05/1.0 with a 121.9 cm span. Free stream velocity was varied from 6.1 m/sec to 76.2 m/sec and the vortex core velocities were measured at locations 3, 6, 12, 24 and 48 chordlengths downstream of the wing trailing edge, yielding vortex ages up to 2.0 seconds. Wing pitch angles of 6, 8, 9 and 12 deg were investigated. Detailed surface pressure distributions and wing force measurements were obtained for each wing tip configuration. Correlation with vortex velocity data taken in previous experiments is good. During the rollup process, vortex core parameters appear to be dependent primarily on vortex age. Trending in the plateau and decay regions is more complex and the machanisms appear to be more unstable. Author

N77-30091# University of Southern Calif., Los Angeles. Dept. of Aerospace Engineering.
FUNDAMENTAL PROBLEMS IN HIGH ALTITUDE AERODYNAMICS Final Report, 1 Oct. 1971 - 30 Sep. 1976
E. P. Muntz 1977 11 p refs
(Grant AF-AFOSR-2169-72)
(AD-A039119; AFOSR-77-0427TR) Avail: NTIS HC A02/MF A01 CSCL 20/4

Measurement of molecular velocity distribution functions in shock waves was studied. Significant results were obtained leading to a quantitative comparison of various computation methods and experiment. The rotational transitions excited in nitrogen rare gas collisions were measured and the interactions between an underexpanded gas plume and a background gas were examined. The electron beam flourescence technique was also investigated and the extension of the technique to measure detailed properties of high vibrational temperature, low rotational temperature flows is described in detail. GRA

N77-30092# Analytical Sciences Corp., Reading, Mass.
AN EXTENDED KALMAN FILTER FOR ESTIMATING AERODYNAMIC COEFFICIENTS Final Report, Sep. 1975 - Sep. 1976
Charles M. Brown, Jr. Eglin AFB, Fla. AFATL Dec. 1976 71 p refs
(Contract F08635-76-C-0117)
(AD-A040594; TASC-TR-636-1; AFATL-TR-158) Avail: NTIS HC A04/MF A01 CSCL 20/4

This report describes an extended Kalman filter (EKF) algorithm developed to estimate the aerodynamic coefficients of projectiles, based on discrete free-flight trajectory measurements. These measurements consist of three spatial positions and three angular orientations, relative to a fixed inertial coordinate system, and time-of-flight at 50 downrange positions along the trajectory. The algorithm is based upon a nonlinear six-degree-of-freedom model of a rotationally symmetric rigid body, and it incorporates a stochastic measurement model that approximates the conditions which exist in a ballistic test range. GRA

N77-30093# Pennsylvania State Univ., University Park. Applied Research Lab.
SIMILARITY AND DECAY LAWS OF MOMENTUMLESS WAKES
Samuel Hassid 26 May 1977 54 p refs
(Contract N00017-73-C-1418)
(AD-A040902; TM-77-187) Avail: NTIS HC A04/MF A01 CSCL 20/4

The decay laws of momentumless wakes as predicted by different models are investigated. Existing work is critically reviewed, and the models are compared with themselves and with experiments. Subsequently, the decay of momentumless wakes is examined using the Reynolds stress models of Lauder, Reece and Rodi, as well as a simpler turbulent energy-dissipation (K-epsilon) model. The last model is shown to be better than the more sophisticated former ones, and exhibits generally fair agreement with existing data. Author (GRA)

N77-30094# National Aerospace Lab., Amsterdam (Netherlands). Flight Dynamics Div.
AERODYNAMIC DATA AND OFF-DESIGN CHARACTERISTICS OF THE MODIFIED QUASI-ELLIPTICAL AIRFOIL SECTION NLR 7101
J. Zwaaneveld 3 Feb. 1976 40 p refs
(Contract NIVR-1723)
(NLR-TR-76012-U) Avail: NTIS HC A03/MF A01

Transonic wind tunnel tests were performed to determine the two dimensional aerodynamic characteristics of the 14.1 % thick modified quasi-elliptical airfoil section NLR 7101. The modification concerns the introduction of aft-camber in order to obtain rear loading. The tests were conducted in the NLR Pilot Tunnel at Mach numbers ranging from 0.3 to 0.825 at angles of attack up to maximum lift. The Reynolds number based on the chord was about two million at the design condition. Lift, drag, and pitching moment coefficients are presented and off-design characteristics in terms of drag divergence, onset of rear separation, lift divergence and maximum lift are discussed. Author (ESA)

N77-30095# Technische Hochschule, Darmstadt (West Germany). Inst. fuer Flugtechnik.
SYSTEMATIC PRESSURE DISTRIBUTION AND FORCE MEASUREMENTS OF TWO YAWED SLENDER WINGS [SYSTEMATISCHE DRUCKVERTEILUNGS- UND KRAFTMESSUNGEN AN ZWEI SCHIEBENDEN SCHLANKEN FLUEGELN]
Bernhard Wagner 9 Feb. 1976 125 p refs In GERMAN Sponsored by Deut. Forschungsgemeinschaft
(IFD-2/76/I) Avail: NTIS HC A06/MF A01

Pressure distribution and force measurements were carried out on two thin slender wings over a wide yaw and angle of

attack range in a wind tunnel. The main object of the investigations was a comparison of the linear slender wing theory with measurements at small angle of attack, especially for the case of a vortex sheet coming from a lateral edge during yawed flight. Measurements were also carried out at larger angles of attack in order to prepare test results for a possible transfer of the aspiration force analogy to arbitrary wing forms and to yawed wings. ESA

N77-30096# Technische Hochschule, Darmstadt (West Germany). Inst. fuer Flugtechnik.
A METHOD FOR CALCULATING FLOW AROUND A YAWED SLENDER WING AT SMALL ANGLE OF ATTACK [EIN VERFAHREN ZUR BERECHNUNG DER STROEMUNG UM SCHIEBENDE SCHLANKE FLUEGEL BEI KLEINER ANSTELLUNG]
Bernhard Wagner 29 Feb. 1976 63 p refs In GERMAN
(IFD-4/76) Avail: NTIS HC A04/MF A01

An extension of Jones' slender wing theory is proposed, which takes into account a vortex sheet coming from a lateral edge during yawed flight. The integral equation for the vorticity of the wake region is solved stepwise by descretization. Formulas are developed for the vorticity, pressure distribution, and aerodynamic coefficients of slender wings of arbitrary planform. The limiting case of the infinitely long yawed wing is considered separately. ESA

N77-30097# Technische Hochschule, Darmstadt (West Germany). Inst. fuer Flugtechnik.
SOME QUADRATURE METHODS FOR LIFTING WING THEORY [UEBER EINIGE QUADRATURVERFAHREN FUER DIE TRAGFLUEGELTHEORIE]
Xaver Hafer and Bernhard Wagner 1977 28 p refs In GERMAN
(IFD-5/76) Avail: NTIS HC A03/MF A01

A method is described for the quadrature in span width direction which employs the properties of orthogonal polynomials similar to the method of Multhopp and Van de Vooren. The quadrature is also executed over each half span width. The effectiveness of the method was investigated by sample calculations for the extended lifting line theory. ESA

N77-30098# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
FUNDAMENTAL AERODYNAMIC STUDY ON LOCAL INJECTION IN A TURBULENT BOUNDARY LAYER Ph.D. Thesis - Poitiers Univ., France, Jun. 1976
Joseph Prieur Apr. 1977 102 p refs In FRENCH; ENGLISH summary Report will also be announced as translation (ESA-TT-412)
(ONERA-NT-1977-2) Avail: NTIS HC A06/MF A01

The mixing zone between a jet and a turbulent boundary layer was studied; injection being made by a two-dimensional slot, inclined with respect to the wall along which the boundary layer is developing. The hot wire technique was used to measure velocity, turbulence, and shear stress profiles. The longitudinal evolution of these profiles was studied. Slot width and injection angle were taken into account. Very important static pressure gradients are shown to exist in the injection region. A theoretical model of turbulence using two transport equations was developed and applied to the present study. The calculated profiles are in good agreement with measurements; they show the importance of streamline curvature effects on the structure of turbulence. Author (ESA)

N77-30067*# Amerind Publishing Co. Pvt. Ltd., New Delhi (India).
AIRCRAFT
In its Soviet Aircraft and Rockets (NASA-TT-F-770) 1977 p 24-80 Transl. into ENGLISH from the book "Zankomtes, samolet i rakets" Moscow, Transport Publishers, 1971 (For primary document see N77-30065 21-01)
Avail: NTIS HC A13/MF A01 CSCL 01A

03 AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; and aircraft accidents.

For related information see also *16 Space Transportation* and *85 Urban Technology and Transportation.*

N77-30099# Naval Postgraduate School, Monterey, Calif.
STATISTICAL ANALYSIS OF US NAVY MAJOR AIRCRAFT ACCIDENT RATES, PILOT AND AIRCRAFT TIME-DEPENDENT VARIABLES M.S. Thesis
Abdur Rashid Mar. 1977 63 p refs
(AD-A040096) Avail: NTIS HC A04/MF A01 CSCL 01/2

Aircraft accident rates by month were analyzed for randomness, cyclic pattern or increasing/decreasing trends for all attack, fighter and propeller type aircrafts. The technique of Runs test was employed to the runs above and below the median. The analysis of pilot/aircraft time dependent variables was also done for both accident and non-accident pilots/aircrafts. The hypothesis tested was, the accidents per hundred pilots/aircrafts were the same for each category of pilot/aircraft variable. The chi square one sample test, the chi square test for K independent samples and the Mann-Whitney U test were used for the analysis. The aircrafts considered for the analysis of pilot variables were A-4, A-7 and F-4, and the aircraft considered for the analysis of aircraft variable was F-4. Author (GRA)

N77-30100# BioTechnology, Inc., Falls Church, Va.
FORMAT PRACTICES FOR DOCUMENTING TIME CRITICAL, HARZARDOUS PROCEDURES Final Report
Theodore J. Post Jun. 1976 32 p refs
(Contract N00014-72-C-0101)
(AD-A036369) Avail: NTIS HC A03/MF A01 CSCL 01/3

The report relates to a study to determine whether reformatting relevant sections of the pilots' Naval Air Training and Operating Procedures Standardization manual was a feasible means of improving the success achieved in ejecting from disabled aircraft. GRA

04 AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

For related information see also *17 Spacecraft Communications, Command, and Tracking* and *32 Communications.*

N77-30101*# Ohio Univ., Athens. Dept. of Electrical Engineering.
INTERACTIVE LORAN-C TO GEOGRAPHIC AND GEOGRAPHIC-TO-LORAN-C COMPUTATION
Lynn M. Piecuch and Robert W. Lilley Aug. 1977 6 p refs (Grant NGR-36-009-017)
(NASA-CR-153985; TM-52) Avail: NTIS HC A02/MF A01 CSCL 17G

The LORAN program is stored in CMS disk files for use by Avionics Engineering Center terminal users. A CMS EXEC file named LORAN controls program operation. The user types LORAN and the program then prompts for data input and produces output on the terminal. The FORTRAN program refers to a disk file of LORAN master data giving station locations, coding delays, repetition rate and station pair identification letters. For Geographic-to-LORAN conversion, no iterative computations are required; the program is a straightforward coordinate conversion based upon the techniques described by the Navy. For LORAN-to-Geographic conversion, the original Navy program required a dead-reckoned position, near the actual unknown fix, to begin computations. No iteration was performed to obtain the LORAN fix, but internal program errors occurred at execution time if the dead-reckoned fix were displaced from the actual fix by more

than a few minutes of latitude or longitude. In order to enhance usefulness of the program for the terminal user, an iterative routine was added which allows a single dead-reckoned position to be entered from the master data file for each LORAN chain. The results compare exactly with the LORAN-C navigation chart, and provide adequate benchmark data for general aviation flight planning and data analysis. Author

N77-30102# National Bureau of Standards, Washington, D. C. Inst. for Basic Standards.
VISUAL RANGE: CONCEPTS, INSTRUMENTAL DETERMINATION, AND AVIATION APPLICATIONS
C. A. Douglas and R. L. Booker Jun. 1977 362 p refs Sponsored by the FAA
(NBS-Mono-159; LC-77-7343) Avail: NTIS MF A01; SOD HC $5.00

Principles, procedures, and instruments used in the measurement of visual range are reviewed. The fundamental concepts of the visual range of objects and lights are discussed. Operational aspects of the several classes of atmospheric attenuation meters are reviewed and representative instruments are described. The development of the NBS transmissometer, its validation, and application to aviation operations is presented. An error analysis is made of the effects of instrument errors and of differences in observer thresholds on visibility measurements. A chronological review of the development and application of the runway visual range concept is included together with a discussion of cloud height measurements. Author

N77-30103# Missouri Univ., Rolla. Dept. of Electrical Engineering.
NAVIGATION CHECKPOINTING USING HORIZON CORRELATION Final Report, 1 Mar. 1975 - 28 Feb. 1977
Gordon E. Carlson Apr. 1977 30 p refs
(Contract N00014-75-C-0639; NR Proj. 387-076)
(AD-A039946; CSR-77-5) Avail: NTIS HC A03/MF A01 CSCL 17/7

A summary of the analysis performed on the horizon correlation navigation checkpointing system is presented. This includes a brief description of the system concept and the analysis techniques used. The tradeoff and performance results are summarized and indicate that the theoretical feasibility of the system has been established. Author (GRA)

N77-30104# Sandia Labs., Albuquerque, N. Mex.
SIMULATION OF INERTIAL INPUTS TO A STRAPDOWN PLATFORM FOR INERTIAL GREAT CIRCLE TRAJECTORIES
Farrell J. Perdreauville Jan. 1977 28 p refs
(Contract E(29-1)-789)
(SAND-76-0620) Avail: NTIS HC A03/MF A01

Equations are developed for computing inertial accelerations and angular rates that would be measured by the accelerometers and gyroscopes in a strapdown inertial platform. The accelerations and angular rates are computed for a body that is moving in an inertial great circle trajectory. A FORTRAN computer code which implements the calculations is listed. ERA

N77-30105# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Inst. fuer Flugfuehrung.
MONTE CARLO SIMULATIONS OF VOR/DME HOLDING PROCEDURES. BASIC IDEAS AND APPLICATIONS
Holger Schnuerer 17 Mar. 1977 25 p refs In GERMAN; ENGLISH summary Report will also be announced as translation (ESA-TT-419)
(DLR-FB-77-08) Avail: NTIS HC A02/MF A01; DFVLR, Cologne DM 13.70

Using DME in addition to VOR allows a better use of the airspace for holding procedures in civil aviation. As yet, there are no procedures for the construction of the airspace to be reserved for a safe execution of these holding procedures, which have been agreed by the international authorities. A method for the construction of holding areas of different probabilities is described, where the simulation of flight paths in a computer using the Monte-Carlo technique has a special importance. The simulation allows the application of an extensive and detailed error model. In addition, the locally different physical conditions may be taken into consideration. Both factors are most important for a safe and economical use of the airspace. Author (ESA)

N77-30106# Naval Postgraduate School, Monterey, Calif.
INTRODUCTORY INVESTIGATION OF THE RANGE MEASURING SYSTEM/DATA COLLECTION SYSTEM (RMS-2/DCS) M.S. Thesis
William F. H. Berthiaume Mar. 1977 62 p refs
(AD-A039921) Avail: NTIS HC A04/MF A01 CSCL 17/7

Various aspects of the operation of the Range Measuring System/Data Collection System (RMS-2/ DCS), which is employed by the United States Army Combat Developments Experimentation Command (USACDEC) at the Hunter Liggett Military Reservation, California, were investigated. System development, operation and reliability were summarized and two problem areas associated with RMS-2/ DCS identified. Author (GRA)

N77-30070*# Amerind Publishing Co. Pvt. Ltd., New Delhi (India).
INSTRUMENTS AND METHOD OF AIR NAVIGATION
In its Soviet Aircraft and Rockets (NASA-TT-F-770) 1977 p 158-177 Transl. into ENGLISH from the book "Znakomtes, samolet i raketa" Moscow, Transport Publishers, 1971 (For primary document see N77-30065 21-01)
Avail: NTIS HC A13/MF A01 CSCL 17G

05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes aircraft simulation technology.

For related information see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics.*

N77-30107*# LTV Aerospace Corp., Dallas, Tex. Vought Systems Div.
F-8 OBLIQUE WING STRUCTURAL FEASIBILITY STUDY
E. Koltko, A. Katz, M. A. Bell, W. D. Smith, R. Lauridia, C. T. Overstreet, C. Klapprott, T. F. Orr, C. L. Jobe, and F. G. Wyatt Nov. 1975 151 p refs
(Contract NAS4-2266)
(NASA-CR-154841; Rept-2-57000/5R-3239) Avail: NTIS HC A08/MF A01 CSCL 01C

The feasibility of fitting a rotating oblique wing on an F-8 aircraft to produce a full scale manned prototype capable of operating in the transonic and supersonic speed range was investigated. The strength, aeroelasticity, and fatigue life of such a prototype are analyzed. Concepts are developed for a new wing, a pivot, a skewing mechanism, control systems that operate through the pivot, and a wing support assembly that attaches in the F-8 wing cavity. The modification of the two-place NTF-8A aircraft to the oblique wing configuration is discussed. Author

N77-30108# Naval Air Test Center, Patuxent River, Md.
A PROGRAM FOR INCREASED FLIGHT FIDELITY IN HELICOPTER SIMULATION
C. Woomer and D. Carico 27 Apr. 1977 22 p refs
(AD-A039324; NATC-TM-77-1-RW) Avail: NTIS HC A02/MF A01 CSCL 14/2

Increased emphasis has been placed on the need for and usefulness of major aviation training devices - flight simulators. A description of a modern trainer and the status of current simulation is provided. High fidelity is necessary to achieve high training transfer to the aircraft. The authors describe the need for and a proposed basic approach to technical simulator flight testing designed to achieve high fidelity. Ideas were formulated as a result of the authors' participation in the development and validation of the SH-2 F Weapons System Trainer, Device 2 F106. Navairtestcen participates in the program as a technical advisor on flight fidelity. Major contributions are aircraft testing for the establishment of criteria data followed by simulator evaluation, both performed by engineering test pilots and flight test engineers. These evaluations used established and disciplined flight test techniques and should be common place in the development and validation of flight trainers. An extensive table

of criteria data tests is provided for reference. Typical instrumentation tables for both the aircraft and trainer are included. Specific comments are made concerning trainer testing problems and the priorities of tests. A discussion is included on simulator data gathering techniques, appropriate parameters, and equipment needed. The scope of a visual system evaluation is presented, along with a description of its usefulness in additional testing of the basic trainer. Author (GRA)

N77-30109# Naval Postgraduate School, Monterey, Calif.
ENERGY MANAGEMENT DISPLAY FOR AIR COMBAT MANEUVERING M.S. Thesis
Stuart Robinson Powrie Mar. 1977 90 p refs
(AD-A040198) Avail: NTIS HC A05/MF A01 CSCL 01/4

A skill and task analysis of air combat maneuvering was performed. This analysis indicated that a device to aid the pilot to maneuver the aircraft to its aerodynamic limits might be useful, but such a device might be ineffective due to a high level of sensory saturation. The concept for design of the project was predicated upon projected use of future displays for fighter aircraft in air combat maneuvering, pilot training and flight safety aspects. The test energy maneuverability display was designed using a microprocessor for dedicated control. The display format was based on color coding various specific power regions and presenting them in the pilot's peripheral vision. An experiment was designed and executed to determine if the pilot could respond to the specific power color codes and maintain performance of critical pilot tasks. An analysis of test variance indicated no significant degradation of pilot performance with the introduction of color coding to the peripheral vision. Author (GRA)

N77-30110# Rock Island Arsenal, Ill. General Thomas J. Rodman Lab.
AIRCRAFT GUN ICING EVALUATION
Max L. Coppock and Merrill D. Gerke Jan. 1977 135 p
(AD-A039834; RIA-R-TR-77-021) Avail: NTIS HC A07/MF A01 CSCL 19/6

This report discusses the results of icing tests conducted on the M28A1 Turret, the 7.62mm, M134 Gun, the 40mm, M129 Grenade Launcher and the 20mm, M195 Gun. The results indicate that all of the weapons can be fired without catastrophic damage after accumulating as much as 1 1/4 inches ice on the muzzle. The use of gas deflectors and/or flash suppressors allow the weapons to be fired without any damage occurring from ice accumulation of up to 1 1/4 inches. The turret suffered only minor limitations of movement, when coated with 1 1/4 inches of ice. The extreme limits of elevation could not be attained due to ice jamming the stops but about 85 percent of the excursion distance was operable. A build-up of over 3/8 inches of ice on one side of the turret will limit the azimuth movement in one direction only. A heavy ice build-up cannot pass the close gap between turret and aircraft fairing behind the turret. This situation can be prevented by pointing the guns into the wind causing the ice build-up to be on the front turret surface. Author (GRA)

N77-30111# Naval Postgraduate School, Monterey, Calif.
DECISION-MAKING AND OPTIMIZATION IN AIRCRAFT DESIGN
Ulrich Haupt Feb. 1977 61 p refs
(AD-A039464; NPS-67HP77021A) Avail: NTIS HC A04/MF A01 CSCL 01/2

The state of the art in aircraft design is surveyed with regard to the decision-making process. It is shown that the empirical approach to decision-making as it is generally practiced in hardware design has inherent limitations. There is an increasing need to consider uncertainties and preferences explicitly. This leads to a new design outlook combining the experience of old-time designers with an analytical approach to complex problems. An outline is given for the development of practice-oriented text material as a most essential step toward preparing engineers for new tasks in design and decision-making. Author (GRA)

N77-30112# Naval Air Test Center, Patuxent River, Md.
THE DEVELOPMENT OF PRIMARY EQUATIONS FOR THE USE OF ON-BOARD ACCELEROMETERS IN DETERMINING AIRCRAFT PERFORMANCE
W. R. Simpson 19 Apr. 1977 28 p refs
(AD-A039174; NATC-TM-76-3-SA) Avail: NTIS HC A03/MF A01 CSCL 01/1

Primary equations for the use of on-board accelerometer data (both flight path and body mounted) for determining aircraft performance are developed. Primary equations are those mathematical relationships which relate measured quantities to useful parameters. They are distinguished from secondary and analysis equations in that the latter are used to either standardize or separate effects in the data. Reference materials are cited, or methods are presented for obtaining all parameters necessary in the use of the primary equations. In cases where sufficient reference materials are not available, the equations are derived. An equation summary is presented for the user who does not wish to go through the development procedures. Author (GRA)

N77-30113# Naval Ship Research and Development Center, Bethesda, Md. Ship Performance Dept.
SEAKEEPING CHARACTERISTICS OF A PRELIMINARY DESIGN FOR A SEA LOITER AIRCRAFT
Alvin Gersten, Jose Bonilla-Norat, and Lawrence Murray Feb. 1977 137 p refs
(AD-A040062; SPD-748-02) Avail: NTIS HC A07/MF A01 CSCL 01/3

A model of a proposed sea loiter aircraft has undergone experiments in the hullborne model at various headings to regular and random waves. The principal goal of the investigation was to provide data for evaluating the habitability characteristics of this concept. The results will also be used to validate computer predictions. Transfer functions are presented in this report, as are plots and tables of standard deviation values and significant values of vehicle response in a seaway. The effect on motions of varying model weight, and the effectiveness of damping plates in reducing motions are discussed. In general, neither of these is found to significantly alter the unusual transfer functions obtained for this craft. The motions of a buoy, whose configuration was selected to provide wave surface following characteristics, and which was also subjected to waves in the towing tank, are discussed in an appendix. Author (GRA)

N77-30114# Naval Weapons Center, China Lake, Calif.
GATOR/AV-8A ENVIRONMENTAL CAPTIVE FLIGHT VIBRATION RESPONSE TESTS Final Report, Oct. 1974 - Jan. 1976
K. T. Katsumoto and W. W. Paramenter Feb. 1977 104 p
(AD-A036498; NWC-TP-5883) Avail: NTIS HC A06/MF A01 CSCL 01/3

A series of flights using an AV-8A aircraft and the GATOR weapon (Navy version, Mk 7 dispenser) were made. Vibration and acoustic responses were measured for this externally carried ordnance during typical flight conditions. Acceleration power spectral density plots are presented, and test levels are recommended. GRA

N77-30115# Auburn Univ., Ala. Engineering Experiment Station.
AUTOMATIC TARGET HAND-OFF USING CORRELATION TECHNIQUES Final Report, 5 Dec. 1975 - 31 Jan. 1977
J. S. Boland, III, L. J. Prinson, G. R. Kane, M. A. Honnell, and E. G. Peters 31 Jan. 1977 145 p refs
(Contract DAAH01-76-C-0396)
(AD-A036435) Avail: NTIS HC A07/MF A01 CSCL 17/8

The problem of automatic hand-off of a target from a precision pointing and tracking system (PTS) to an imaging missile seeker is considered in this report. The approach taken is to search for the target in the seeker field of view (FOV) using the PTS video as a reference. When the target is located, the seeker line of sight is adjusted automatically such that the target is at the center of its FOV at which point the seeker tracker can lock on to the target. Location of the target in the seeker FOV can best be accomplished using correlation techniques. The approach taken is to consider the most accurate but yet most costly in computation time and hardware requirements. Tradeoffs are then considered in order to obtain a real-time correlator (i.e., one which can compute the correlation surface at the rate of the incoming live video from the seeker). The effect of these trade-offs on correlation accuracy and other system performance criteria is given. A correlation algorithm is chosen and an implementation of this algorithm is given. An alternate implementation using

an analog adder rather than a digital adder tree is recommended. GRA

06 AIRCRAFT INSTRUMENTATION

Includes cockpit and cabin display devices; and flight instruments.

For related information see also *19 Spacecraft Instrumentation* and *35 Instrumentation and Photography*.

N77-30116# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
DEVELOPMENT OF PROTOTYPE OPTICAL CONVOLUTION AIRSPEED SENSOR Final Report, Jan. - Sep. 1976
Michael J. Rudd Wright-Patterson AFB, Ohio AFFDL Jan. 1977 89 p refs
(Contract F33615-76-C-3051; AF Proj. 1987)
(AD-A039469; BBN-3380; AFFDL-TR-76-132) Avail: NTIS HC A05/MF A01 CSCL 01/4

This report describes the continued development of the Optical Convolution Airspeed Indicator. This relatively inexpensive instrument measures true airspeed by projecting a shadowgraph image of the wake from a small heater onto grating and measuring the ripple frequency of the turbulence crossing the grating. Measurements were made on the structure of the turbulent wake so that the heater size and grating can be optimized. A new type of signal processor, called a correlation discriminator, was developed to measure the frequency of the signal in the presence of a large amount of noise. An active heater protection circuit was built to prevent it from burning out when there is no air flow. The effects of environmental conditions on the sensor were examined and they can all be met, although the effects of rain and icing require further study. A new improved Prototype Mark 2 was built and tested. There were significant changes in reading at angles of attack and sideslip above 10 to 15 deg. GRA

N77-30117# Naval Postgraduate School, Monterey, Calif.
AN EVALUATION OF A RASTER SCAN DISPLAY FOR USE IN AN AIRCRAFT INFORMATION HANDLING SYSTEM M.S. Thesis
Walton Lewis Hogan, Jr. Mar. 1977 99 p refs
(AD-A039652) Avail: NTIS MF A01 CSCL 09/2

The work described herein was part of continuing research in the area of computer aided information management and display as applied to air operations on an aircraft carrier. The purpose of this study was to evaluate the Hughes CONOGRAPHIC-12 Graphics Display Terminal in a computer graphics-aided aircraft information handling system. The approach taken in this study was to implement a realistic aircraft information handling system on a Digital Equipment Corporation PDP-11/50 minicomputer within the conventions of the C programming language and the UNIX operating system at the Naval Postgraduate School Computer Laboratory. The study includes a description of previous efforts in the area, a description of the CONOGRAPHIC-12 hardware and the software written to evaluate the display terminal. The study also includes an evaluation of the CONOGRAPHIC-12 display terminal as both a dynamic interactive display terminal and a repeater-only terminal at six representative stations. Author (GRA)

N77-30118# Vought Corp., Dallas, Tex.
MASTER MONITOR DISPLAY APPLICATIONS STUDY FOR THE A-7E Final Report, Mar. 1976 - Jan. 1977
R. H. Sanderlin and P. E. Greer Jan. 1977 82 p
(Contract N62269-76-C-0198)
(AD-A039882; Rept-2-57110-TR-3367; NADC-77075-30)
Avail: NTIS HC A05/MF A01 CSCL 01/4

A study program to define the conceptual requirements and implementation schemes for the incorporation of a Master Monitor Display (MMD) into an A-7E has been completed. The study identifies the candidate functions for display on the MMD that were selected from the existing A-7E cockpit functions, defines what is to be displayed on the MMD corresponding to the current warnings, cautions, advisories and auxiliary data with reference to flight modes, and defines the implementation interface requirements. The study results reported in this document verify the feasibility of utilizing the integrated display concept in an A-7E aircraft to replace certain cockpit functions presently performed with dedicated indicators and instruments. Author (GRA)

N77-30069*# Amerind Publishing Co. Pvt. Ltd., New Delhi (India).
AIRCRAFT EQUIPMENT
In its Soviet Aircraft and Rockets (NASA-TT-F-770) 1977 p 140-157 Transl. into ENGLISH from the book "Znakomtes, samolet i raketa" Moscow, Transport Publisher, 1971 (For primary document see N77-30065 21-01)
Avail: NTIS HC A13/MF A01 CSCL 01D

07 AIRCRAFT PROPULSION AND POWER

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and on-board auxiliary power plants for aircraft.

For related information see also *20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *44 Energy Production and Conversion*.

N77-30119*# Naval Air Propulsion Test Center, Trenton, N.J.
ROTOR BURST PROTECTION PROGRAM: EXPERIMENTATION TO PROVIDE GUIDELINES FOR THE DESIGN OF TURBINE ROTOR BURST FRAGMENT CONTAINMENT RINGS Final Report, 1 1972 - 1976
G. J. Mangano, J. T. Salvino, and R. A. DeLucia Mar. 1977 53 p refs
(NASA-CR-135166; NAPTC-PE-98) Avail: NTIS HC A04/MF A01 CSCL 21E

The results of a program of rotor burst containment experimentation that provides guidelines for the design of optimum weight turbine rotor disk fragment containment rings are presented. The guidelines were derived by establishing the relationships between a measure of the ring's capability to contain fragment energy with respect to it's weight and other significant ring and rotor variables such as the: (1) rotor tip diameter; (2) number of rotor fragments; and (3) ring radial thickness and axial length. The experiments consisted mainly of bursting 14 and 31 inch diameter turbine rotors into encircling containment rings made from centrifugally cast 4130 steel. Rules are given for achieving optimum weight ring designs. Author

N77-30120# Rockwell International Corp., Columbus, Ohio. Aircraft Div.
FLIGHT TEST OF AN 8000 psi LIGHTWEIGHT HYDRAULIC SYSTEM (LHS) Final Report, 23 Jun. 1976 - 23 Apr. 1977
Joseph N. Demarchi and Robert K. Haning Apr. 1977 88 p refs
(Contract N62269-76-C-0254)
(AD-A039717; NR77H-21; NADC-77098-30) Avail: NTIS MF A01 CSCL 13/7

An 8000 psi hydraulic lateral control system was installed in a T-2C airplane. Four pilots evaluated the test installation, accumulating 11.5 flight hours. Operational characteristics were very similar to the original 3000 psi system. The 8000 psi installation functioned exceptionally well. Successful completion of this project confirmed that 8000 psi lightweight hydraulic systems can be designed, fabricated, and maintained without special techniques or state-of-the-art advances. Author (GRA)

N77-30121# Detroit Diesel Allison, Indianapolis, Ind.
AN EXPERIMENTAL INVESTIGATION OF A SUBSCALE VARIABLE PRESSURE RATIO HIGH THRU FLOW TURBINE Final Technical Report, Jan. - Dec. 1976
D. J. Helton, H. G. Lueders, and J. R. Arvin Wright-Patterson AFB, Ohio AFAPL Feb. 1977 91 p
(Contract F33615-76-C-2068; AF Proj. 3066)
(AD-A039823L; AFAPL-TR-77-7) Avail: NTIS HC A05/MF A01 CSCL 21/5

This program investigates the aerodynamics of a subscale model of a variable pressure ratio high through flow turbine.

The problem areas are: Small limit loading margin, High rotor relative inlet Mach number, low aspect ratio blading, large rotor turning, and low hub/tip radius ratio. GRA

N77-30122# Aeronautical Systems Div., Wright-Patterson AFB, Ohio.

AN ATTEMPT TO CORRELATE NORMAL VORTICITIES WITH TOTAL PRESSURE DISTORTION PATTERNS AT THE ENTRANCE TO A GAS TURBINE ENGINE Final Report, Jun. 1974 - Aug. 1976

Stephen M. Clark Feb. 1977 89 p refs
(AD-A040370; ASD-TR-76-34) Avail: NTIS HC A05/MF A01 CSCL 21/5

An attempt is made to predict the worst-case pressure distortion produced by a distortion screen at the entrance to a gas turbine engine using only steady-state total pressure measurements. The vector sum of radial and circumferential vorticity, called normal vorticity, is compared to both the difference between steady-state and worst-case distortion patterns, and the standard deviation of the high response pressure measurements, called turbulence. Average values of turbulence and vorticity are found to be unrelated to the increase in distortion between steady-state and worst-case pressure measurements. Probe-by-probe analysis of the data indicates that a correlation may exist between vorticity and the distortion increase. Although a final prediction technique is not developed, an improved test program and refined data analysis techniques are outlined.
Author (GRA)

N77-30123# Motoren- und Turbinen-Union Muenchen G.m.b.H. (West Germany).

AERODYNAMICALLY HIGHLY LOADED COMPRESSOR BLADING WITH BOUNDARY LAYER CONTROL [AERODYNAMISCH HOCHBELASTETE VERDICHTERBESCHAUFELUNG MIT GRENZSCHICHTBEEINFLUSSUNG]

L. Fottner Bonn DOKZENTBw 1977 61 p refs In GERMAN; ENGLISH summary Sponsored by Bundesmin. fuer Verteidigung
(BMVg-FBWT-77-4) Avail: NTIS HC A04/MF A01; DOKZENTBw DM 30

The influence of blowing on the boundary layer control of bladed turbocompressors was investigated. An analysis of the literature on boundary layer control by blowing techniques is presented. On the basis of an investigation on the blowing effect on a flapped wing, a semi-empirical method for boundary layer calculation was developed. The method starts from a given pressure distribution for inviscid flow and calculates the boundary layer behavior according to the integral method of Rotta. Detailed parameter variations were performed for the cascade, which was designed by using an empirical method. The following conditions for an optimal slot configuration were derived: the slot location should be as close to the leading edge as possible; the slot width should be small; the blowing jet velocity is the most important parameter for the effectiveness of boundary layer control. ESA

N77-30124# Naval Research Lab., Washington, D. C.

QUANTITATIVE TLC ANALYSIS OF AMINE ANTIOXIDANTS IN HIGH-TEMPERATURE JET ENGINE LUBRICANTS

Paul J. Sniegoski Apr. 1977 9 p refs
(AD-A039909; NRL-MR-3490) Avail: NTIS HC A02/MF A01 CSCL 11/8

A quantitative thin-layer chromatography (TLC) method with a relative standard deviation of four percent is described for the analysis of commonly used amine antioxidants in high-temperature jet engine lubricants. The method is convenient in that after development of the plates, the components develop characteristic visible colors suitable for analysis. Author (GRA)

N77-30125# Naval Air Engineering Center, Lakehurst, N.J. Ground Support Equipment Dept.

NON-INTEGRATED GAS TURBINE ENGINE DIAGNOSTICS TRADEOFF ANALYSIS Final Technical Report, Jul. 1975 - Jul. 1976

H. C. MacLaughlin 10 May 1977 93 p refs
(AD-A039494; NAEC-GSED-100) Avail: NTIS HC A05/MF A01 CSCL 21/5

Diagnostic equipment and techniques to be included in a non-integrated system to detect and isolate the four most prevalent malfunctions in Navy aircraft gas turbine engines were selected. Each of twenty-five candidate elements were considered on the basis of technical feasibility, cost-effectiveness, and diagnostic need. Gas path analysis, with trending, and borescope inspection were selected as the most effective methods to diagnose the leading engine malfunctions (63%), foreign object damage and hot section distress. Other elements to be included in the proposed embryonic system are called oil analysis, time temperature recording indicator/low cycle fatigue counters, vibration testers, trim testers, test system vibration equipment, vibration signal analysis equipment, temperature sensing system tester, and Jetcal Analyzer. Oil analysis techniques being developed indicate a significant improvement compared to spectrometric analysis of diagnostic purposes. A summary of specific elements for utilization at each of three levels of maintenance and an engineering development plan with proposed implementation milestones are included. Author (GRA)

N77-30126# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.

PARAMETRIC PERFORMANCE EVALUATION OF A JET ENGINE DERIVED FROM A TURBOCHARGER M.S. Thesis

Richard B. Brown Mar. 1977 119 p
(AD-A039116; AFIT/GAE/AE/76D-2) Avail: NTIS HC A06/MF A01 CSCL 21/5

Previous conceptual studies have shown that it is feasible to construct a low-thrust, jet engine, based on a production turbocharger at relatively low cost. A parametric evaluation was performed on a turbojet engine derived from an AiResearch 1.5 lb(m)/sec airflow turbocharger unit to determine its static performance characteristics and the maximum attainable thrust without augmentation or major component modification. The performance of various turbine housing/nozzle combinations was measured in steady state operation using a much improved instrumentation system, together with various system improvements. Parameters were measured on a common time base and plotted to depict the total performance of the unit over its usable range. Maximum thrust obtained was 97 lb(f), exceeding the initially predicted theoretical value of 67 lb(f) by 45%. Data was reduced to coded 3 digit numbers for programming and plotting using the CDC 6600 computer. The results were machine plots depicting the performance characteristics of the unaugmented engine for use in further studies including augmentation. In addition, computer performance programs for coded raw data were written for future data reduction and analysis.
Author (GRA)

N77-30127# Arizona Univ., Tucson. Engineering Experiment Station.

LAMINAR FORCED CONVECTION TO MIXTURES OF INERT GASES IN PARALLEL PLATE DUCTS Interim Report

D. M. McEligot, M. F. Taylor, and F. Durst 1 Jun. 1976 56 p refs
(Contract N00014-75-C-0694)
(AD-A040648; Rept-1248-4) Avail: NTIS HC A04/MF A01 CSCL 13/1

Heat transfer and wall friction parameters were obtained numerically to demonstrate the effects of mixture composition and gas property variation for heating or cooling in regenerative heat exchangers; the situation is modelled by laminar flow through short ducts with constant wall heat flux. For design predictions accounting for the effects of property variation, the property ratio method is better than the film temperature method for heat transfer while the latter method is preferable for apparent wall friction--providing that the present definitions of the non-dimensional parameters be employed. Author (GRA)

N77-30068*# Amerind Publishing Co. Pvt. Ltd., New Delhi (India).

AIRCRAFT ENGINES

In its Soviet Aircraft and Rockets (NASA-TT-F-770) 1977 p 81-139 Transl. into ENGLISH from the book "Znakomtes, samolet i raketa" Moscow, Transport Publishers, 1971 (For primary document see N77-30065 21-01)
Avail: NTIS HC A13/MF A01 CSCL 21E

08 AIRCRAFT STABILITY AND CONTROL

Includes aircraft handling qualities; piloting; flight controls; and autopilots.

N77-30128 Purdue Univ., Lafayette, Ind.
EFFECTS OF CONTROL LAWS AND RELAXED STATIC STABILITY ON VERTICAL RIDE QUALITY OF FLEXIBLE AIRCRAFT Ph.D. Thesis
Philip Arnold Roberts 1976 112 p
Avail: Univ. Microfilms Order No. 77-7522

Ride quality is shown to be relatively invariant under various popular control laws. Handling quality variations are shown to be major contributors to ride quality variations on both vehicles. Relaxed static stability is artificially implemented on the study vehicles to investigate its effects on ride quality. The B-52H ride quality is generally degraded when handling characteristics are automatically restored by a feedback control to the original values from relaxed stability conditions. The B-1 shows little ride quality sensitivity to the same analysis due to the small rigid body contribution to load factors at the flight condition investigated. Dissert. Abstr.

N77-30129*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
ESTIMATES OF THE EFFECTIVENESS OF AUTOMATIC CONTROL IN ALLEVIATING WAKE VORTEX INDUCED ROLL EXCURSIONS
Bruce E. Tinling Aug. 1977 15 p
(NASA-TM-73267; A-7127) Avail: NTIS HC A02/MF A01 CSCL 01C

Estimates of the effectiveness of a model following type control system in reducing the roll excursion due to a wake vortex encounter were obtained from single degree of freedom computations with inputs derived from the results of wind tunnel, flight, and simulation experiments. The analysis indicates that the control power commanded by the automatic system must be roughly equal to the vortex induced roll acceleration if effective limiting of the maximum bank angle is to be achieved. Author

N77-30130*# Systems Research Lab., Champaign, Ill.
DIGITAL CONTROLLER DESIGN: CONTINUOUS AND DISCRETE DESCRIBING FUNCTION ANALYSIS OF THE IPS SYSTEM
1 Aug. 1977 56 p
(Contract NAS8-32358)
(NASA-CR-150362; Rept-1-7-ED-07418(1F)) Avail: NTIS HC A04/MF A01 CSCL 01D

The digital IPS with wire cable and flex pivot nonlinearity is simulated on the digital computer to determine the effects of varying the sampling period T on the system stability, and to determine a range of optimal values of the parameters of the digital controller. The listing of the computer program is shown as well as the Dahl model for the flex pivot nonlinearity. For the wire cable nonlinearity, two ranges of values were used and the nominal values of the digital controller parameters are included. Author

N77-30131# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany).
MAXIMUM LIKELIHOOD IDENTIFICATION USING KALMAN FILTERING - LEAST SQUARES ESTIMATIONS: A COMPARISON FOR THE ESTIMATION OF STABILITY DERIVATIVES CONSIDERING GUST DISTURBANCES
Gerd Schulz 12 Aug. 1975 53 p refs In GERMAN; ENGLISH summary Translation was announced as N76-30227
(DLR-FB-75-54) Avail: NTIS HC A04/MF A01; DFVLR, Oberpfaffenhofen DM 21.80

Starting from the force and moment equations of the longitudinal motion on an aircraft, a state space model is derived which allows consideration of measurement bias, gust disturbances and nonlinear effect. The maximum likelihood identification procedure including the corresponding linear state estimation according to Kalman is described. Additionally a least squares estimation procedure is presented. Comparing the above estimation methods in application to the identification of stability derivatives of the longitudinal motion of an aircraft, the maximum likelihood procedure turns out to be superior. The identification of the nondimensional derivatives improves the speed of convergence. Author

N77-30132*# Systems Technology, Inc., Hawthorne, Calif.
DEVELOPMENT OF AN INTEGRATED CONFIGURATION MANAGEMENT/FLIGHT DIRECTOR SYSTEM FOR PILOTED STOL APPROACHES Final Report
Roger H. Hoh, Richard H. Klein, and Walter A. Johnson Washington NASA Aug. 1977 90 p refs
(Contract NAS2-6441)
(NASA-CR-2883; TR-1015-4) Avail: NTIS HC A05/MF A01 CSCL 01C

A system analysis method for the development of an integrated configuration management/flight director system for IFR STOL approaches is presented. Curved descending decelerating approach trajectories are considered. Considerable emphasis is placed on satisfying the pilot centered requirements (acceptable workload) as well as the usual guidance and control requirements (acceptable performance). The Augmentor Wing Jet STOL Research Aircraft was utilized to allow illustration by example, and to validate the analysis procedure via manned simulation. Author

N77-30133# Texas Univ., Austin. Dept. of Aerospace Engineering and Engineering Mechanics.
ANALYTICAL FLUTTER STUDIES OF A SUBSONIC ACTIVELY CONTROLLED, VARIABLE GEOMETRY WIND TUNNEL MODEL, VOLUME 1 Final Report, 1 Feb. 1976 - 31 Jan. 1977
Larry Lehman and Ronald Stearman Mar. 1977 105 p refs
(Contract F44620-76-C-0072)
(AD-A039245; AFOSR-77-0637TR-Vol-1) Avail: NTIS HC A06/MF A01 CSCL 20/4

A structural dynamic system identification was experimentally conducted on a wind tunnel flutter model with active aerodynamic controls. Mass and stiffness parameters were varied on the model to determine an optimum configuration for the wind tunnel tests. Author (GRA)

N77-30134# Texas Univ., Austin. Dept. of Aerospace Engineering and Engineering Mechanics.
WIND TUNNEL EXPERIMENTS ON AN ACTIVELY CONTROLLED, VARIABLE GEOMETRY FLUTTER MODEL Final Report, 1 Feb. 1976 - 31 Jan. 1977
Jeff Long Mar. 1977 109 p refs
(Contract F44620-76-C-0072)
(AD-A039216; AFOSR-77-0638TR) Avail: NTIS HC A06/MF A01 CSCL 20/4

A reduction in flutter margin can occur for variable geometry aircraft when the wing of the aircraft is swept into the vicinity of the tail. Experiments on an aeroelastic wind tunnel model with active aerodynamic controls demonstrated that the flutter margins of these configurations can be increased through techniques other than the standard structural modifications. Improved margins were attained experimentally by employing rapidly responding aerodynamic controls activated by an optimal feedback. Author (GRA)

N77-30135# Toronto Univ. (Ontario). Inst. for Aerospace Studies.
A LABORATORY INVESTIGATION INTO FLIGHT PATH PERTURBATIONS DURING STEEP DESCENTS OF V/STOL AIRCRAFT Final Report, Sep. 1972 - Jun. 1976
L. D. Reid, B. Etkin, H. W. Tennissen, and P. C. Hughes Wright-Patterson AFB, Ohio AFFDL Aug. 1976 401 p refs Sponsored in part by the Natl. Res. Council of Canada
(Contract F33615-73-C-3013; AF Proj. 8219)
(AD-A040101; AFFDL-TR-76-84) Avail: NTIS HC A18/MF A01 CSCL 01/2

A study into the prediction of V/STOL aircraft flight path perturbations during steep landing approaches is presented. A discussion of possible approaches to the problem is reviewed. The fixed probe approach, where two point space/time correlations are measured in a boundary layer wind tunnel along the glide slope is derived is detail. A second in the moving probe approach

is which a suitable three component velocity probe is moved along the glide slope in a boundary layer wind tunnel and the time history of the resulting measurements used to determine the response of the aircraft. A candidate moving probe apparatus is analyzed and its feasibility evaluated. Two similar boundary layer wind tunnels are used to generate simulations of the planetary shear layer. The properties of the 8 x 8 in. tunnel are described along with the associated instrumentation. Author

N77-30136# Advisory Group for Aerospace Research and Development, Paris (France).
A STUDY OF STANDARDIZATION METHODS FOR DIGITAL GUIDANCE AND CONTROL SYSTEMS
May 1977 548 p refs
(AGARD-AR-90; ISBN-92-835-1244-8) Avail: NTIS HC A23/MF A01

Standardization methods for digital guidance and control systems are examined, particularly with regard to data transmission techniques and high level programming languages. Discussion of the general problems and techniques is included as well as reports on the particular experiences of the individual nations. Annexes contain full details of the techniques studied, and include comparisons of data transmission methods and high level languages. These comparisons are designed to outline the relevent features of the different techniques. Author

N77-30071*# Amerind Publishing Co. Pvt. Ltd., New Delhi (India).
AIRCRAFT CYBERNETICS
In its Soviet Aircraft and Rockets (NASA-TT-F-770) 1977 p 178-197 Transl. into ENGLISH from the book "Znakomtes, samolet i raketa" Moscow, Transport Publishers, 1971 (For primary document see N77-30065 21-01)
Avail: NTIS HC A13/MF A01 CSCL 01C

09 RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tube facilities; and engine test blocks.

For related information see also *14 Ground Support Systems and Facilities (Space).*

N77-30137# Naval Training Equipment Center, Orlando, Fla.
ACCEPTANCE TESTING OF FLYING QUALITIES AND PERFORMANCE, COCKPIT MOTION, AND VISUAL DISPLAY SYSTEM SIMULATION FOR FLIGHT SIMULATORS Final Report, Jul. 1974 - Jan. 1977
William T. Harris May 1977 154 p refs
(XF5552202)
(AD-A040288; NAVTRAEQUIPC-IH-251) Avail: NTIS HC A08/MF A01 CSCL 01/2

An investigation of the techniques used by Government and industry in performing acceptance testing of flight simulators was conducted. Recommended specification languages are provided for testing three major areas of flight simulator systems; Flying Qualities and Performance simulation, Cockpit Motion simulation, and Visual Display simulation. Author (GRA)

N77-30138# Air Force Human Resources Lab., Brooks AFB, Tex.
ENERGY CONSERVATION THROUGH THE OPTIMIZATION OF HYDRAULIC POWER SUPPLIES FOR THE SIX DEGREE OF FREEDOM MOTION SYSTEM Final Report
Michael L. Cyrus Mar. 1977 17 p
(AD-A040443; AFHRL-TR-77-7) Avail: NTIS HC A02/MF A01 CSCL 13/7

The objective of this project was to estimate the approximate hydraulic fluid flow requirements for the six degree of freedom motion system of the type specified in MIL-STD-1558 and determine means by which motion hydraulic supplies can be cut, combined, or made more efficient. This paper defines the approach, data collection, analysis, and results of that project. Author (GRA)

N77-30139# ARO, Inc., Arnold Air Force Station, Tenn. Arnold Engineering Development Center.
AERODYNAMIC CHARACTERISTICS OF PERFORATED WALLS FOR TRANSONIC WIND TUNNELS Final Report, 1 Jan. 1975 - 1 Jan. 1977
J. L. Jacocks Jun. 1977 78 p
(AD-A040904; ARO-PWT-TR-77-30) Avail: NTIS HC A05/MF A01 CSCL 20/4

A combined experimental-theoretical approach is developed for determination of the crossflow characteristics of ventilated walls. The technique is based on measurement of static pressures at the boundaries of a two-dimensional flow, calculation of the interior flow properties with Murman-Cole type finite difference techniques, and calculation of the boundary-layer development on and mass flux distribution through the ventilated wall using Patankar-Spalding type solution techniques. Results verify the validity of assuming proportionality between local pressure and flow angle as a boundary condition for wall interference estimates. However, it is also shown that the thickness of the boundary layer represents a dominant influence on the perforated wall characteristics, with both the slope and intercept of the characteristic being dependent on the boundary layer. The effects on the wall characteristics of suppressing the edgetone noise by use of screen overlays or splitter plates within discrete holes are documented. Author (GRA)

N77-30530*# Air Force Aero Propulsion Lab., Wright-Patterson AFB, Ohio.
A NEW RAPID METHOD OF SOLAR SIMULATOR CALIBRATION
Bernd Ross *In* NASA. Lewis Res. Center Terrest. Photovoltaic Meas., 2 1976 p 183-202 refs (For primary document see N77-30521 21-42)
(Contract F33615-76-C-2050)
Avail: NTIS HC A17/MF A01 CSCL 14B

N77-30532*# National Bureau of Standards, Washington, D.C.
A LASER BASED CHARACTERIZATION FACILITY FOR SILICON PHOTOCELL STUDIES
Jon Geist, Michael A. Lind, A. Russell Schaefer, and Edward F. Zalewski *In* NASA. Lewis Res. Center Terrest. Photovoltaic Meas., 2 1976 p 223-232 refs (For primary document see N77-30521 21-42)
Avail: NTIS HC A17/MF A01 CSCL 14B

12 ASTRONAUTICS (GENERAL)

For extraterrestrial exploration see *91 Lunar and Planetary Exploration.*

N77-30140*# National Aeronautics and Space Administration, Washington, D. C.
A MARS 1984 MISSION
Jul. 1977 164 p
(NASA-TM-78419) Avail: NTIS HC A08/MF A01 CSCL 22A

Mission objectives are developed for the next logical step in the investigation of the local physical and chemical environments and the search for organic compounds on Mars. The necessity of three vehicular elements: orbiter, penetrator, and rover for in situ investigations of atmospheric-lithosperic interactions is emphasized. A summary report and committee recommendations are included with the full report of the Mars Science Working Group. A.R.H.

N77-30141*# Oregon Univ. Health Sciences Center, Portland. Dept. of Neurology.
CANDIDATE SPACE PROCESSING TECHNIQUES FOR BIOMATERIALS OTHER THAN PREPARATIVE ELECTROPHORESIS Final Report, 10 Apr. - 31 Dec. 1976
D. E. Brooks 31 Dec. 1976 44 p refs
(Contract NAS8-31899)
(NASA-CR-150370) Avail: NTIS HC A03/MF A01 CSCL 22A

The advantages of performing the partition and countercurrent distribution (CCD) of cells in phase separated aqueous polymer

systems under reduced gravity were assessed. Other possible applications considered for the space processing program include the freezing front separation of cells, adsorption of cells at the air-water interface, and the macrophage electrophoretic mobility test for cancer. Author

N77-30142*# Lockheed Missiles and Space Co., Huntsville, Ala.
IMPROVED CATALYSTS BY LOW-G PROCESSING
P. G. Grodzka and E. A. Picklesimer Aug. 1977 85 p refs
(Contract NAS8-32352)
(NASA-CR-150377; LMSC-HREC-FR-D084883) Avail: NTIS HC A05/MF A01 CSCL 07D

The advantages of space for manufacturing more perfect microcrystalline morphologies and structures will be investigated. Production of smaller silver and palladium crystals with enhanced catalytic properties is discussed. The elimination of convection accompanying electrodeposition of fine metallic powders at high overvoltages in a low gravity environment is outlined. G.D.H.

N77-30143*# Massachusetts Inst. of Tech., Cambridge. Center for Space Research.
RESEARCH IN SPACE SCIENCE AND TECHNOLOGY Semiannual Progress Report
L. E. Beckley Aug. 1977 28 p
(Grant NGL-22-009-638)
(NASA-CR-153374) Avail: NTIS HC A03/MF A01 CSCL 22A

Progress in various space flight research programs is reported. Emphasis is placed on X-ray astronomy and interplanetary plasma physics. Topics covered include: infrared astronomy, long base line interferometry, geological spectroscopy, space life science experiments, atmospheric physics, and space based materials and structures research. Analysis of galactic and extra-galactic X-ray data from the Small Astronomy Satellite (SAS-3) and HEAO-A and interplanetary plasma data for Mariner 10, Explorers 47 and 50, and Solrad is discussed. J.M.S.

N77-30144# Standard Electrik Lorenz A.G., Stuttgart (West Germany). Erzeugnisgebiet Navigation.
DEFINITION STUDY OF SPACELAB EXPERIMENTS IN THE FIELD OF COMMUNICATION AND NAVIGATION Final Report
Hermann Endres, Jork Bretting, Dieter Rother, Karl-Juergen Hoerning, Gerhard Bodemann, Manfred Moellenhoff, Walter Kloepfer, Peter Kreutzer, Sandor Seboek, Rainer Wolff et al Bonn Bundesmin. fuer Forsch. u. Technol. Dec. 1976 412 p refs In GERMAN; ENGLISH summary Prepared jointly with AEG-Telefunken, Ulm, West Ger. and MBB, Munich
(Contracts BMFT-WRT-1074; DFVLR-BPT-01-E0594)
(BMFT-FB-W-76-28) Avail: NTIS HC A18/MF A01; ZLDI, Munich DM 86.10

Experiment proposals, submitted to the contractor by scientific institutes and industry served as the basis for the study. In the foreground are experiments of wave propagation, navigation, and communication. Objectives and possible applications as well as the performance and equipment for the different experiment proposals with cost and development time are supplied. The results of this study should aid in developing a Spacelab Payload Program for experiments in communication and navigation. Author (ESA)

N77-30145# European Space Agency, Paris (France).
MODEL AND TEST PHILOSOPHIES FOR SPACELAB PAYLOADS
May 1977 51 p refs
(ESA-DP/ST(77)-1) Avail: NTIS HC A04/MF A01

Philosophies for Spacelab payload modeling and testing are given. Although the wide range of characteristics of possible Spacelab payloads hinders the establishment of all-embracing modeling and testing specifications, ESA felt the necessity to: acquaint the Spacelab user community with the subject, emphasizing the new aspects introduced by the advent of Spacelab; provide them, to the largest extent possible, dealing with such a complex topic, with the most comprehensive guidelines on the subject. The main purpose therefore is to assist the potential Spacelab users in the definition of a development and manufacturing program for their experiment equipment, by introducing the subject, clarifying the terminology, giving a description of the possible development path of experiment equipment for Spacelab and providing general guidelines. Author (ESA)

N77-30072*# Amerind Publishing Co. Pvt. Ltd., New Delhi (India).
ASTRONAUTICS
In its Soviet Aircraft and Rockets (NASA-TT-F-770) 1977 p 198-271 Transl. into ENGLISH from the book "Znakomtes, samolet i raketa" Moscow, Transport Publishers, 1971 (For primary document see N77-30065 21-01)
Avail: NTIS HC A13/MF A01 CSCL 22A

13 ASTRODYNAMICS

Includes powered and free-flight trajectories; and orbit and launching dynamics.

N77-30146# General Electric Co., Philadelphia, Pa. Space Div.
DESIGN OPTIMIZATION OF THE MOUNTING CONFIGURATION OF SKEWED WHEELS FOR SPACECRAFT ATTITUDE CONTROL APPLICATION
D. P. Bonello and I. Shin 15 Mar. 1977 33 p
(Doc-77SDS001) Avail: NTIS HC A03/MF A01

An analytical investigation performed to define the optimum skew mounting configuration of reaction wheels used for spacecraft attitude control is described. Criteria are chosen as the bases of the optimization process, one involving performance, the second, weight or momentum capacity. The results are a set of parametric equations from which the optimum wheel mounting configuration can be quickly established. Author

N77-30147*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
ATTITUDE REORIENTATION OF SPACECRAFT BY MEANS OF IMPULSE CONING
C. William Martz Washington Aug. 1977 52 p refs
(NASA-TN-D-8452; L-11127) Avail: NTIS HC A04/MF A01 CSCL 22A

Minimum maneuver costs for attitude reorientation of spacecraft of all possible inertial distribution over a wide range of maneuver angles by use of the impulse coning method of reorientation was studied. Maneuver cost is proportional to the product of fuel consumed and time expended during a maneuver. Assumptions included impulsive external control torques, rigid-body spacecraft, rest-to-rest maneuvers, and no disturbance torques. Also, coning maneuvers were constrained to have equal initial and final cone angles. Maneuver costs are presented for general reorientations as well as for spin-axis reorientations where final attitude about the spin axis is arbitrary. Author

N77-30148# Royal Aircraft Establishment, Farnborough (England).
THE 29th-ORDER HARMONICS IN THE GEOPOTENTIAL FROM THE ORBIT OF ARIEL 1 AT 29:2 RESONANCE
Doreen M. C. Walker Aug. 1976 16 p refs
(RAE-TR-76110; BR54491) Avail: NTIS HC A02/MF A01

In analyzing the orbit of Ariel 1 to determine upper-atmosphere winds, it was observed that the orbital inclination underwent a noticeable perturbation under the action of air drag in November 1969 at the 29:2 resonance with the earth's gravitational field, when the satellite track over the earth repeats every 2 days after 29 revolutions. The variations in the inclination and eccentricity of the orbit between July 1969 and February 1970 were analyzed, using 35 US Navy orbits, and fitted with theoretical curves to obtain lumped values of 29th-order harmonic coefficients in the geopotential. Author (ESA)

N77-30149# Aerospace Corp., El Segundo, Calif. Engineering Science Operations.
OPTIMAL THREE BURN ORBIT TRANSFER
J. T. Betts 21 Mar. 1977 21 p refs
(Contract F04701-76-C-0077)
(AD-A039257; TR-0077(2901-03)-1; SAMSO-TR-77-79) Avail:

NTIS HC A02/MF A01 CSCL 22/3

This report presents an optimal three burn solution to a class of orbit transfer problems requiring large changes in orbital inclination. A nonlinear programming algorithm was used in conjunction with a simplified trajectory simulation, which used Keplerian orbit transfers and impulsive velocity increments. A number of parametric results were obtained using the simplified simulation. The validity of the simplified simulation was established for specific vehicle configurations with finite burns and oblate earth effects included. The effect of multiple stage rockets has also been treated. Author (GRA)

14 GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE)

Includes launch complexes, research and production facilities; ground support equipment, mobile transporters; and simulators.

For related information see also *09 Research Support Facilities (Air)*.

No abstracts in this category.

15 LAUNCH VEHICLES AND SPACE VEHICLES

Includes boosters; manned orbital laboratories; reusable vehicles; and space stations.

N77-30150*# McDonnell-Douglas Astronautics Co., St. Louis, Mo.

OUTER PLANET PROBE ENGINEERING MODEL THERMAL VACUUM TEST

M. G. Grote Washington NASA Jul. 1977 54 p refs

(Contract NAS2-9027)

(NASA-CR-152016) Avail: NTIS HC A03/MF A01 CSCL 22A

A thermal vacuum test was performed on the engineering model of the outer planets atmospheric entry probe. Steady state runs at three simulated radioisotope heating unit loads and one transient run simulating the pre-entry power profile were made to determine the thermal characteristics of the engineering model. An analytic simulation of the model was correlated to the test data. Several steady state and one transient run were made with the model attached to the spacecraft adapter to determine the thermal interface between the model and the adapter. Author

N77-30151*# McDonnell-Douglas Astronautics Co., Huntington Beach, Calif.

SPACE STATION SYSTEMS ANALYSIS STUDY. PART 3: DOCUMENTATION. VOLUME 1: EXECUTIVE SUMMARY

Jul. 1977 47 p refs

(Contract NAS9-14958)

(NASA-CR-151503; MDC-G6922-Pt-3-Vol-1) Avail: NTIS HC A03/MF A01 CSCL 22A

The space stations systems analysis study is summarized. A cost efffective system concept capable of meeting a broad spectrum of mission requirements was developed. Candidate objectives were reviewed and implementation requirements were defined. Program options for both low earth and geosynchronous orbits were examined. Space construction concepts were analyzed and defined in detail. B.B.

N77-30152*# McDonnell-Douglas Astronautics Co., Huntington Beach, Calif.

SPACE STATION SYSTEM ANALYSIS STUDY. PART 3: DOCUMENTATION. VOLUME 2: TECHNICAL REPORT

Jul. 1977 201 p refs

(Contract NAS9-14958)

(NASA-CR-151502; MDC-G6922-Pt-3-Vol-2) Avail: NTIS HC A10/MF A01 CSCL 22A

An analysis of construction operation is presented as well as power system sizing requirements. Mission hardware requirements are reviewed in detail. Space construction base and design configurations are also examined. B.B.

N77-30153*# McDonnell-Douglas Astronautics Co., Huntington Beach, Calif.

SPACE STATION SYSTEMS ANALYSIS STUDY. PART 3: DOCUMENTATION. VOLUME 3: APPENDIXES. BOOK 1: SUPPORTING DATA

Jul. 1977 174 p refs

(Contract NAS9-14958)

(NASA-CR-151500; MDC-G6922-Pt-3-Vol-3-Bk-1) Avail: NTIS HC A08/MF A01 CSCL 22A

Operational and configurational characteristics and options of the space crane system are investigated. Some of the following items are also discussed in detail; (1) external design drives; (2) flight dynamics analysis; (3) earth services mission hardware; (4) commercial space processing development, and (5) subsystem description. B.B.

N77-30154*# McDonnell-Douglas Astronautics Co., Huntington Beach, Calif.

SPACE STATION SYSTEMS ANALYSIS STUDY. PART 3: DOCUMENTATION. VOLUME 3: APPENDIXES. BOOK 2: SUPPORTING DATA

Jul. 1977 300 p ref

(Contract NAS9-14958)

(NASA-CR-151501; MDC-G6922-Pt-3-Vol-3-Bk-2) Avail: NTIS HC A13/MF A01 CSCL 22A

The development of the module concepts are reviewed, and a number of functional elements are listed. Other areas examined include some of the following; (1) mission operations; (2) environmental control and life support subsystems concepts; (3) thermal heat rejection; (4) space radiation effect analysis; and (5) satellite power system test requirements. B.B.

N77-30155*# Dayton Univ. Research Inst., Ohio.

COMPENDIUM OF APPLICATIONS TECHNOLOGY SATELLITE USER EXPERIMENTS Final Report, 1967-1973

Nicholas A. Engler, Jerry D. Strange, and Gerald F. Hein Aug. 1976 247 p refs Prepared in cooperation with NASA, Lewis Res. Center

(Contract NAS3-19699)

(NASA-CR-135057) Avail: NTIS HC A11/MF A01 CSCL 22A

The achievements of the user experiments performed with ATS satellites from 1967 to 1973 are summarized. Included are fixed and mobile point to point communications experiments involving voice, teletype and facsimile transmissions. Particular emphasis is given to the Alaska and Hawaii satellite communications experiments. The use of the ATS satellites for ranging and position fixing of ships and aircraft is also covered. The structure and operating characteristics of the various ATS satellite are briefly described. Author

N77-30156# Naval Postgraduate School, Monterey, Calif.

A KALMAN FILTER APPLICATION TO THE ADVANCED TACTICAL INERTIAL GUIDANCE SYSTEM OF THE AIR-LAUNCHED LOW VOLUME RAMJET CRUISE MISSILE M.S. Thesis

John Archie VanDevender Dec. 1976 94 p refs

(AD-A039338) Avail: NTIS HC A05/MF A01 CSCL 17/7

A Montecarlo simulation is conducted to ascertain performance of the ATIGS system which is a proposed air-launched cruise missile configuration. The simulation is conducted within a local-level inertial frame consisting of down-range, cross-range, and up as primary reference vectors. Efforts are made to measure the relative effects associated with the intended pure position reset provided by a MICRAD sensor as compared with those effects which could be expected from a linear suboptimal Kalman filtering scheme used in conjunction with the MICRAD sensor. Author (GRA)

N77-30157# McDonnell-Douglas Astronautics Co., Titusville, Fla.

STORAGE RELIABILITY OF MISSILE MATERIAL ACCELERATED TESTING OF PATRIOT SYSTEM ELECTRONIC COMPONENTS Final Report, Jun. 1974 - Apr. 1977
Jim McGarry, Van Weisslug, Ed Sisul, Bob Watson, and Larry Conway 29 Apr. 1977 442 p refs
(Contract DAAH01-74-C-0928)
(AD-A039788; MDC-E1601) Avail: NTIS HC A19/MF A01 CSCL 09/1

Samples of 200 each of 21 different parts, planned for use in the PATRIOT missile system, were subjected to a comprehensive test program to determine their storage reliability potential. The test parts included beam lead and chip and wire integrated circuits, transistors, diodes, resistors, capacitors, inductors, and a ceramic substrate. The report documents the testing approach used; detailed test results on each part type; detailed analysis of the test data; failure analysis results of failed parts, including failure modes, failure mechanisms, and cause of failure. High temperature and applied electrical bias were employed as accelerating factors in the testing, and both the Arrhenius and Eyring reaction rate models were employed in analysis of the data. Conclusions and recommendations relative to the storage reliability potential of each part type tested in the program are derived and documented. GRA

N77-30158# Martin Marietta Aerospace, Denver, Colo.
VIKING SOFTWARE DATA Final Technical Report, 24 May 1976 - 23 May 1977
Nelson H. Prentiss, Jr. Griffiss AFB, N. Y. RADC May 1977 300 p
(Contract F30602-76-C-0269)
(AD-A040770; MCR-77-114; RADC-TR-77-168) Avail: NTIS HC A013/MF A01 CSCL 09/2

This report describes the approach used by Martin Marietta Corporation to develop the Flight, Test and Mission Operations Software Systems that were used to support scientific investigations on the surface of Mars by two Viking Landers in 1976. Overviews of each of the three software systems are included, together with descriptions of a number of techniques used to develop them. The report stresses problems encountered and their solutions and indicates the major lessons learned. Author (GRA)

N77-30159# Boston Coll., Chestnut Hill, Mass. Space Data Analysis Lab.
ATTITUDE DETERMINATION SYSTEM FOR ROCKETS USING GYROSCOPIC PLATFORMS Final Report, 1 Nov. 1974 - 30 Sep. 1976
Brian F. Sullivan and Marvin E. Stick 31 Oct. 1976 55 p
(Contract F19628-75-C-0045)
(AD-A039766; BC-SDAL-76-4A; AFGL-TR-76-0310) Avail: NTIS HC A04/MF A01 CSCL 19/7

The system used to calculate the attitude of a rocket whose principal attitude measuring system is a gyroscopic platform is discussed. The various types of gyro systems, their comparisons and differences are presented. A synopsis of the mathematical analysis used to compute the attitude is displayed. Various data refinement techniques and correction procedures for rockets whose systems malfunction are presented. Results in the form of plots of the angle of attack between the velocity vector and rocket axis for several rockets whose attitudes were determined by this system are exhibited. Author (GRA)

N77-30160# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
MANEUVERING TARGET SIMULATION FOR TESTING THE TERMINAL GUIDANCE OF AIR-TO-AIR MISSILES M.S. Thesis
Harry G. Paddon Mar. 1977 181 p refs
(AD-A039757; AFIT/GE/EE/77-2) Avail: NTIS HC A09/MF A01 CSCL 01/2

There was a need for a complete maneuvering target for air-to-air combat simulation. A computer program was developed with logic and tactical decisions subroutines. The parameters for these decisions corresponded to the differences in pilots and the relative aircraft states. The decision subroutines provided the desired control inputs to accomplish the required maneuvers. Validation of the simulated target was accomplished by use of five test runs from different initial conditions as well as twenty runs from the same initial conditions. Author (GRA)

N77-30161# Office of the Comptroller of the Army, Washington, D. C. Directorate of Cost Analysis.
ARMY LIFE CYCLE COST MODEL FOR MISSILE SYSTEMS Final Report
Mitchell L. Mayer, Michael M. Kishiyama, and Gene R. Farmelo Sep. 1976 225 p
(AD-A040143) Avail: NTIS HC A10/MF A01 CSCL 16/4

This document describes the methodology and rationale used by the Directorate of Cost Analysis, Comptroller of the Army, for developing an estimate for all or part of the life cycle cost of a tactical missile weapon system. The model reflects the cost analysis discipline which has been established Army-wide with the implementation of DA Pamphlets 11-2 through 11-5 and AR 11-18. It is intended for use by cost analysts as a guide for developing an Independent Parametric Cost Estimate. Current costing procedures and technical data are included. Updates to this document will be made as revision or additions to the data base and methodology are made. Author (GRA)

N77-30162# Harvard Univ., Cambridge, Mass. Div. of Engineering and Applied Physics.
DECENTRALIZED CONTROL IN COMPUTER COMMUNICATION Interim Report
F. C. Schoute Apr. 1977 137 p refs
(Contract N00014-75-C-0648; Grant NSF ENG-76-11824)
(AD-A039222; TR-667) Avail: NTIS HC A07/MF A01 CSCL 17/2

In the decentralized control of computer communication it is appropriate to consider the controllers as having the same objective: the efficient operations of the communication medium. In this sense decentralized control of computer communication fits in the area of multi-person decision making that is designated as team theory. Section 2:1 was devoted to aspects of team theory, specifically to the introduction of the notions of symmetric team problems and symmetric solutions. For the purpose of introduction and immediate application it was sufficient to consider only finite team problems in strategic form. For the purpose of making the theory more complete it is important to extend the definition and analysis of symmetric team problems and symmetric solutions to team problems with an infinite number of possible strategies and to consider the problem in extensive form. GRA

16 SPACE TRANSPORTATION

Includes passenger and cargo space transportation e.g., shuttle operations; and rescue techniques.

For related information see also *03 Air Transportation and Safety* and *85 Urban Technology and Transportation*.

N77-30163*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
ENGINEERING ANALYSIS DIVISION INTERNAL NOTE. OFT-1 MARGIN ASSESSMENT
L. D. Austin, Jr. 8 Aug. 1977 322 p refs
(NASA-TM-74836; JSC-13034) Avail: NTIS HC A14/MF A01 CSCL 22A

The results are documented of an analysis conducted to determine space shuttle vehicle (SSV) subsystem margins for the reference flight profile for the first orbital flight test (OFT-1). In general, the results show increased margins for the OFT-1 indicators when compared to Mission 3A resutls. The inclusion of element and wing aerodynamic variations on OFT-1, in combination with winds and systems dispersions, resulted in the forward Z (FTO1) attach load indicator exceeding specified limites. The inboard and outboard elevon hinge moment margins (9 percent and 3 percent, respectively) on OFT-1 reflect values consistent with the load relief requirements dictated by elevon hinge moment variations. All other structural load indicators for OFT-1 had margins in excess of 10 percent. The SSV first stage stagnation heating indicators for OFT-1 were about 45 percent less than for Mission 3A. The hydraulic systems demands for both missions were essentially the same. The results also show OFT-1

performance requirements from the consideration of winds and dispersions to be approximately 3,300 lbs greater than Mission 3A. Author

N77-30164*# Chrysler Corp., New Orleans, La.
AN INVESTIGATION TO DETERMINE THE STATIC PRESSURE DISTRIBUTION OF THE 0.00548 SCALE SHUTTLE SOLID ROCKET BOOSTER (MSFC MODEL NUMBER 468) DURING REENTRY IN THE NASA/MSFC 14 INCH TRISONIC WIND TUNNEL (SA28F)
W. F. Braddock (Northrop Services, Inc., Huntsville, Ala.) and G. D. Streby (Northrop Services, Inc., Huntsville, Ala.) May 1977 306 p refs
(Contract NAS9-13247)
(NASA-CR-151082; DMS-DR-2244) Avail: NTIS HC A14/MF A01 CSCL 01A

The results of a pressure test of a .00548 scale 146 inch Space Shuttle Solid Rocket Booster (SRB) with and without protuberances, conducted in a 14 x 14 inch trisonic wind tunnel are presented. Static pressure distributions for the SRB at reentry attitudes and flight conditions were obtained. Local longitudinal and ring pressure distributions are presented in tabulated form. Integration of the pressure data was performed. The test was conducted at Mach numbers of 0.40 to 4.45 over an angle of attack range from 60 to 185 degrees. Roll angles of 0, 45, 90 and 315 degrees were investigated. Reynolds numbers per foot varied for selected Mach numbers. Author

N77-30165*# Chrysler Corp., New Orleans, La.
RESULTS OF TESTS USING A 0.0125-SCALE MODEL (70-QT) OF THE SPACE SHUTTLE VEHICLE ORBITER IN THE AEDC VKF TUNNEL B (IA22), VOLUME 2
J. J. Daileda (Rockwell Intern. Space Div., Downey, Calif.) and J. Marroquin (Rockwell Intern. Space Div., Downey, Calif.) May 1977 620 p refs
(Contract NAS9-12347)
(NASA-CR-151080; DMS-DR-2327-Vol-2) Avail: NTIS HC A99/MF A01 CSCL 01A

Tabulated data of an experimental investigation are presented which was conducted in the AEDC/VKF Tunnel B to obtain interaction effects of RCS thruster jet plumes on SSV aerodynamics during staging to simulate RTLS abort. Interaction effects of the orbiter RCS thruster jet plumes on the orbiter and ET aerodynamics were investigated. RCS thruster jet plumes were simulated using both air and a 15 percent argon 85 percent helium gas mixture. The ET angle of attack range was -40 to +25 deg at sideslip angles of 0, 3, and 6 degrees. Orbiter angle of attack was varied from -15 to +10 degrees at sideslip angles of 0 and 3 deg. External tank full scale separation distances simulated were 0 to 1400 in. axially; 0 to 54 in. laterally; and a range of -100 to 1000 in. vertically. Data were also obtained on the ET in the interference-free flow field. Quiescent (no tunnel flow) thruster plume interaction data were obtained on the orbiter and orbiter-ET combination. Tests were conducted at Mach number 6 and a Reynolds number of 0.86 million per foot. Author

N77-30166*# Magnavox Co., Torrance, Calif. Advanced Products Div.
SHUTTLE/GPSPAC EXPERIMENTATION STUDY Final Report
Jack Moses and J. F. Flack 15 Aug. 1977 170 p
(Contract NAS9-15314)
(NASA-CR-151496; R-5740) Avail: NTIS HC A08/MF A01 CSCL 17G

The utilization is discussed of the GPSPAC, which is presently being developed to be used on the low altitude host vehicle (LAHV), for possible use in the shuttle avionics system to evaluate shuttle/GPS navigation performance. Analysis and tradeoffs of the shuttle/GPS link, shuttle signal interface requirements, oscillator tradeoffs and GPSPAC mechanical modifications for shuttle are included. Only the on-orbit utilization of GPSPAC for the shuttle is discussed. Other phases are briefly touched upon. Recommendations are provided for using the present GPSPAC and the changes required to perform shuttle on-orbit navigation. Author

N77-30167*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SHUTTLE PROGRAM: GROUND TRACKING DATA PROGRAM DOCUMENT SHUTTLE OFT LAUNCH/LANDING
William M. Lear (TRW Systems Group, Redondo Beach, Calif.) Aug. 1977 97 p refs
(NASA-TM-74866; JSC-12988; Rept-77-FM-41) Avail: NTIS HC A05/MF A01 CSCL 22A

The equations for processing ground tracking data during a space shuttle ascent or entry, or any nonfree flight phase of a shuttle mission are given. The resulting computer program processes data from up to three stations simultaneously: C-band station number 1; C-band station number 2; and an S-band station. The C-band data consists of range, azimuth, and elevation angle measurements. The S-band data consists of range, two angles, and integrated Doppler data in the form of cycle counts. A nineteen element state vector is used in Kalman filter to process the measurements. The acceleration components of the shuttle are taken to be independent exponentially-correlated random variables. Nine elements of the state vector are the measurement bias errors associated with range and two angles for each tracking station. The biases are all modeled as exponentially-correlated random variables with a typical time constant of 108 seconds. All time constants are taken to be the same for all nine state variables. This simplifies the logic in propagating the state error covariance matrix ahead in time. Author

17 SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING

Includes telemetry; space communications networks; astronavigation; and radio blackout.

For related information see also *04 Aircraft Communications and Navigation* and *32 Communications*.

N77-30168# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
NAVIGATION ACCURACY REQUIREMENTS OF AEROMANEUVERING SPACE VEHICLES M.S. Thesis
Robert J. Chambers Mar. 1977 75 p refs
(AD-A039697; AFIT/GA/EE/77-1) Avail: NTIS HC A04/MF A01 CSCL 22/3

A preliminary investigation was conducted to determine the navigational accuracy required by the Aeromaneuvering Orbit-to-Orbit Shuttle (AMOOS) during the atmospheric phase of flight. The guidance scheme, which is the same as the one developed by Lockheed in the original AMOOS study, uses the parameters of velocity, flight path angle, and density altitude to correct to a nominal trajectory. Density altitude is obtained from atmospheric density, which is calculated from vehicle acceleration. Errors in velocity, flight path angle, and acceleration were introduced into a three-degree of freedom computer simulation of the vehicle trajectory using bank angle commands generated by the guidance equations. Deviations from standard atmospheric density were taken into account. The maximum errors allowable that still permitted the vehicle to attain its phasing orbit apogee altitude of 720 km (+ or - 100 km) were determined. Three types of error were investigated: constant, sinusoidal, and random. For time-varying errors the frequency dependence was examined, as was cross-coupling of errors. It was concluded that the guidance scheme can tolerate fairly large errors and still guide to an acceptable apogee altitude. The navigational accuracy required for the atmospheric phase of flight is within the capability of present day astrionics. Author (GRA)

18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE

Includes spacecraft thermal and environmental control; and attitude control.

For life support systems see *54 Man/System Technology and Life Support*. For related information see also *05 Aircraft Design, Testing and Performance* and *39 Structural Mechanics*.

No abstracts in this category.

19 SPACECRAFT INSTRUMENTATION

For related information see also *06 Aircraft Instrumentation* and *35 Instrumentation and Photography*.

N77-30169 Pennsylvania State Univ., University Park.
ROCKET-BORNE TIME-OF-FLIGHT MASS SPECTROMETRY Ph.D. Thesis
Robert F. Reiter 1976 257 p
Avail: Univ. Microfilms Order No. 77-9588

Theoretical and numerical analyses are made of planar, cylindrical, and spherical-electrode two-field time-of-flight mass spectrometers in order to optimize their operating conditions. A resolving power enhancement method is introduced which can improve the resolving power of these instruments by a factor of 7.5. A numerical analysis of potential barrier gating in time-of-flight mass spectrometers is also made. Experimental studies of a miniature cylindrical-electrode time-of-flight mass spectrometer are presented. The extremely high sensitivity of these instruments and their ability to operate at D-region pressures with an open source make them ideal instruments for D-region ion composition measurements. The design, testing, and successful launch of a sounding rocket experiment package carrying a cylindrical electrode time-of-flight mass spectrometer are discussed.
Dissert. Abstr.

20 SPACECRAFT PROPULSION AND POWER

Includes main propulsion systems and components e.g., rocket engines; and spacecraft auxiliary power sources.

For related information see also *07 Aircraft Propulsion, 28 Propellants and Fuels*, and *44 Energy Production and Conversion*.

N77-30170*# Rocketdyne, Canoga Park, Calif.
ENGINE HYDRAULIC STABILITY Final Report
R. C. Kesselring and K. M. Sprouse Jul. 1977 237 p refs
(Contract NAS9-14801)
(NASA-CR-151499; R-77-159) Avail: NTIS HC A11/MF A01 CSCL 21H

An analytical injector model was developed specifically to analyze combustion instability coupling between the injector hydraulics and the combustion process. This digital computer dynamic injector model will, for any imposed chamber of inlet pressure profile with a frequency ranging from 100 to 3000 Hz (minimum) accurately predict/calculate the instantaneous injector flowrates. The injector system is described in terms of which flow segments onter and leave each pressure node. For each flow segment, a resistance, line lengths, and areas are required as inputs (the line lengths and areas are used in determining inertance). For each pressure node, volume and acoustic velocity are required as inputs (volume and acoustic velocity determine capacitance). The geometric criteria for determining inertances of flow segments and capacitance of pressure nodes was set. Also, a technique was developed for analytically determining time averaged steady-state pressure drops and flowrates for every flow segment in an injector when such data is not known. These pressure drops and flowrates are then used in determining the linearized flow resistance for each line sement of flow. Author

N77-30171*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
SOLID ROCKET MOTOR INTERNAL INSULATION
Sherwood E. Twichell, ed. (Hercules, Inc., Wilmington, Del.) and Russell B. Keller, Jr. Dec. 1976 124 p refs
(NASA-SP-8093) Avail: NTIS HC A06/MF A01 CSCL 21H

Internal insulation in a solid rocket motor is defined as a layer of heat barrier material placed between the internal surface of the case propellant. The primary purpose is to prevent the case from reaching temperatures that endanger its structural integrity. Secondary functions of the insulation are listed and guidelines for avoiding critical problems in the development of internal insulation for rocket motors are presented. B.B.

N77-30172# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
ROCKET ENGINES
Ke Bi-Tien 19 Oct. 1976 19 p Transl. into ENGLISH from Hang Kung Chih Shih (Mainland China), no. 10, 1975 p 22-25
(AD-A039198; FTD-ID(RS)I-0540-76) Avail: NTIS HC A02/MF A01 CSCL 21/8

This article discusses the composition, procedures, advantages, disadvantages, development and application of solid rocket engines and solid-liquid rocket engines. GRA

23 CHEMISTRY AND MATERIALS (GENERAL)

Includes biochemistry and organic chemistry.

N77-30173*# Kanner (Leo) Associates, Redwood City, Calif.
FORMATION OF FATTY ACIDS IN PHOTOCHEMICAL CONVERSIONS OF SATURATED HYDROCARBONS
T. A. Telegina, T. Ye. Pavlovskaya, and A. I. Ladyzhenskaya Washington NASA Jul. 1977 10 p refs Transl. into ENGLISH from Izv. Akad. Nauk SSSR, Ser. Biol. (USSR), v. 9, no. 3, 1974 p 433-436
(Contract NASw-2790)
(NASA-TM-75133) Avail: NTIS HC A02/MF A01 CSCL 07C

Abiogenic synthesis of fatty acids was studied in photochemical conversions of saturated hydrocarbons. It was shown that, in a hydrocarbon water CaCO3 suspension, the action of 254 nm UV rays caused the formation of fatty acids with a maximum number of carbon atoms in the chain not exceeding that in the initial hydrocarbon. Synthesis of acetic, propionic, butyric, valeric, caproic, enanthic and caprylic (in the case of octane) acids occurs in heptane water CaCO3 and octane water CaCO3 systems.
Author

24 COMPOSITE MATERIALS

Includes laminates.

N77-30174 Southern Methodist Univ., Dallas, Tex.
ANALYSIS OF NONLINEAR STRESS-STRAIN BEHAVIOR OF FIBER-REINFORCED COMPOSITE MATERIALS Ph.D. Thesis
Harold Sledge Morgan 1976 379 p
Avail: Univ. Microfilms Order No. 77-9790

The Jones-Nelson linear material model developed for graphitic materials of low orthotropy was extended to treat the nonlinear stress-strain behavior fiber reinforced composite materials of high orthotropy. Mechanical properties were defined in terms of strain energy. Mechanical strain energy data were extrapolated as an adaptation necessary to treat nonlinear stress-strain behavior. Extrapolation approaches and other characteristics of the model are outlined. Dissert. Abstr.

N77-30175 Wyoming Univ., Laramie.
MICROMECHANICAL ASPECTS OF THE ENVIRONMENTAL BEHAVIOR OF COMPOSITE MATERIALS Ph.D. Thesis
Alva Keith Miller 1976 159 p
Avail: Univ. Microfilms Order No. 77-11273

A finite element analysis method which is used to analyze the micromechanical stress state in a fiber reinforced composite was developed. The method is based on generalized plane strain conditions, which allows the analysis to be pseudo-three-dimensional in character. Nonlinear material behavior is included which requires that the analysis utilize incremental loading parameters. The constitutive relationships for plastic material behavior are formulated for both plane strain and generalized plane strain conditions, with hygrothermal dilatation strains included. The constitutive equations for transversely isotropic material behavior are also developed for the plane strain and generalized plane strain conditions, again with hygrothermal strains included, and incorporated into the analysis method.
Dissert. Abstr.

N77-30176 North Carolina State Univ., Raleigh.
THE EROSION AND THERMAL SHOCK RESISTANCE OF HOT PRESSED TANTALUM CARBIDE CONTAINING FREE CARBON AND REFRACTORY FIBERS Ph.D. Thesis
Leroy Honeycutt, III 1976 114 p
Avail: Univ. Microfilms Order No. 77-11130

Thermal shock resistance of selected carbide composites fabricated by hot pressing techniques was investigated. Matrix materials had additions of specific amounts of free carbon and refractory fibers. Material parameters considered were compressive fracture strength, Young's modulus, weight loss during erosion, and fiber matrix interfacial phenomena. Dissert. Abstr.

N77-30177 Georgia Inst. of Tech., Atlanta.
DESIGN AND CONSTRUCTION OF NEW HONEYCOMB SANDWICH PANELS USING SUPERPLASTIC FORMING AND VACUUM FORMING TECHNIQUE Ph.D. Thesis
Amilcar Jose Gomez Fermin 1977 260 p
Avail: Univ. Microfilms Order No. 77-10902

Analytical and experimental investigations were carried out to design and construct a honeycomb sandwich panel core using the vacuum core pressure forming technique. The structure was designed to make more area available for the core facing bond, and so that inexpensive heat welding could be used. Core mechanical properties were insensitive to buckling and independent of core thickness. Dissert. Abstr.

N77-30178*# Stanford Research Inst., Menlo Park, Calif.
EFFECTS OF ILLUMINATION ON THE CONDUCTIVITY PROPERTIES OF SPACECRAFT INSULATING MATERIALS Final Report
R. C. Adamos and J. E. Nanevicz Jul. 1977 84 p refs
(Contract NAS3-20080; SRI Proj. 4904)
(NASA-CR-135201) Avail: NTIS HC A05/MF A01 CSCL 11D

Experimental data on the dark and illuminated conductivities of Kapton V and polyvinylidene fluoride (PVF2) films are described as well as the changes in insulating properties produced in Kapton H, Kapton V, PVF2, and FEP Teflon films as result of prolonged exposure to solar illumination. An overall summary of the results of tests is presented. A general introduction and a description of the experimental apparatus and procedures used are also given. Author

N77-30179*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va. Dept. of Engineering Science and Mechanics.
SIGNATURE ANALYSIS OF ACOUSTIC EMISSION FROM GRAPHITE/EPOXY COMPOSITES
Samuel S. Russell and Edmund G. Henneke, II Sep. 1977 84 p refs
(Grant NsG-1238)
(NASA-CR-153414; VPI-E-77-22) Avail: NTIS HC A05/MF A01 CSCL 11D

Acoustic emissions were monitored for crack extension across and parallel to the fibers in a single ply and multiply laminates of graphite epoxy composites. Spectrum analysis was performed on the transient signal to ascertain if the fracture mode can be characterized by a particular spectral pattern. The specimens were loaded to failure quasistatically in a tensile machine. Visual observations were made via either an optical microscope or a television camera. The results indicate that several types of characteristics in the time and frequency domain correspond to different types of failure. Author

N77-30180*# Boeing Commercial Airplane Co., Seattle, Wash.
DESIGN AND FABRICATION OF GRAPHITE-EPOXY BOLTED WING SKIN SPLICE SPECIMENS Technical Report, Feb. 1976 - May 1977
R. W. Johnson and J. E. McCarty May 1977 54 p refs
(Contract NAS1-14327)
(NASA-CR-145216; D6-44503) Avail: NTIS HC A04/MF A01 CSCL 11D

Graphite-epoxy bolted joint specimens were designed and fabricated. These specimens were to be representative of a side-of-body wing skin splice with a 20-year life expectancy in a commercial transport environment. Preliminary tests were performed to determine design values of bearing and net tension stresses. Based upon the information developed, a three-fastener-wide representative wing skin splice was designed for a load of 2627 KN/m (15,000 lbf/in.). One joint specimen was fabricated and tested at NASA. The wing skin splice failed at 106 percent of design ultimate load. This joint design achieved all static load objectives. Fabrication of six specimens, together with their loading fixtures, was completed, and the specimens were delivered to NASA-LRC. Author

N77-30181*# ECON, Inc., Princeton, N.J.
PRELIMINARY ECONOMIC EVALUATION OF THE USE OF GRAPHITE COMPOSITE MATERIALS IN SURFACE TRANSPORTATION, PHASE 1 RESULTS
11 Jul. 1977 145 p
(Contract NASw-2781)
(NASA-CR-154809; Rept-77-165-1) Avail: NTIS HC A07/MF A01 CSCL 11D

Composite materials are discussed with emphasis on the identification of the characteristics of those materials that make them attractive for use in surface transportation. Potential uses of graphite composites are given including automotive applications and the effects of materials substitution on vehicle characteristics and performance. Preliminary estimates of the economic effects of the use of graphite composite materials on vehicle manufacturers and consumers are included. The combined impact on the national economy of vehicle design changes to meet mandated fuel efficiency requirements and the extensive use of graphite composite materials in the automotive industry is considered.
Author

N77-30182*# Kanner (Leo) Associates, Redwood City, Calif.
TESTING PROCEDURES FOR CARBON FIBER REINFORCED PLASTIC COMPONENTS
H. J. Gosse, M. Kaitatzidi, and S. Roth Washington NASA Jul. 1977 75 p refs Transl. into ENGLISH from 9th Ann. Meeting of the Ger. Aerospace Assoc., Munich, 14-16 Sep. 1976, DGLR paper 76-215 p 1-77 Original was announced as A77-16588
(Contract NASw-2790)
(NASA-TM-75125) Avail: NTIS HC A04/MF A01 CSCL 11D

Tests for studying the basic material are considered and quality control investigations involving preimpregnated materials (prepreg) are discussed. Attention is given to the prepreg area weight, the fiber area weight of prepregs, the resin content, volatile components, the effective thickness, resin flow, the resistance to bending strain, tensile strength, and shear strength. A description of tests conducted during the manufacturing process is also presented, taking into account X-ray methods, approaches of neutron radiography, ultrasonic procedures, resonance methods and impedance studies. Author

N77-30183*# IIT Research Inst., Chicago, Ill.
SPACE STABLE THERMAL CONTROL COATINGS Technical Report, 1 Mar. - 30 Jun. 1977
Y. Harada Jul. 1977 21 p refs
(Contract NAS8-31906)
(NASA-CR-150376; IITRI-D6118-16(TAR)) Avail: NTIS HC A02/MF A01 CSCL 11D

Both pigment and paint studies were conducted to determine the effect of calcination conditions on optical properties of Zn2TiO4. Paint studies were concerned with the effects of spraying technique, of pigment to binder ratio, and of thickness on the properties of finished coatings. The results are reviewed in detail. Pigments prepared by calcination at 600 deg. to 800 deg. were evaluated. Low temperature syntheses were conducted to determine; (1) extent of ZnO + TiO2 reaction; and (2) the potential of higher peak reflectance with finer particle size powder obtained at lower temperatures. B.B.

N77-30184# Aerospace Corp., El Segundo, Calif. Chemistry and Physics Lab.

EFFECTS OF WATER VAPOR ON THERMAL SHIELD MATERIALS Interim Report

Alfred A. Fote 19 Apr. 1977 11 p refs
(Contract F04701-76-C-0077)
(AD-A039737; TR-0077(2270-30)-1; SAMSO-TR-77-91) Avail: NTIS HC A02/MF A01 CSCL 11/4

Three of the materials commonly used to insulate spacecraft from solar radiation are aluminized mylar, aluminized kapton, and silvered teflon. Damage to or deterioration of these materials would lead to large scale temperature excursions of the spacecraft. One possible mechanism for such deterioration would be the occurrence of high humidity prior to launch. A study was conducted to determine the vulnerability of these materials to humidity. It was found that aluminized mylar and aluminized kapton remain unaffected, but that silvered teflon is seriously damaged in a period of hours. Author (GRA)

N77-30185# Fiber Materials, Inc., Biddeford, Maine.

FABRICATION OF DISCONTINOUS GRAPHITE-ALUMINUM COMPOSITES VIA PULTRUSION Final Report

Horst Gigerenzer and Gary C. Strempek Feb. 1977 48 p
(Contract DAAG46-76-C-0068; DA Proj. 1T1-63102-D-071)
(AD-A039959; AMMRC-CTR-77-8) Avail: NTIS HC A03/MF A01 CSCL 11/4

The objective of the program was to produce high strength graphite-aluminum composite bars of round and rectangular cross-sections via a pultrusion process, with the resulting composite structure consisting of discontinuous graphite fibers in an aluminum matrix. Graphite-aluminum composite wire preforms were produced using a liquid metal infiltration process. Continuous Thornel 300 polyacrylonitrile (PAN) based graphite fiber tows were infiltrated with both 6061 and 356 aluminum alloy melts. GRA

N77-30186# Oxford Univ. (England).

THE THERMAL AND ELECTRICAL CONDUCTIVITY OF METAL-POWDER/RESIN COMPOSITES Annual Report, 31 Dec. 1975 - 31 Dec. 1976

H. M. Rosenberg and F. F. T. deAraujo Jan. 1977 20 p refs
(Grant DA-ERO-75-G-018; DA Proj. 7T1-61102-B-32D)
(AD-A040950; AR-2) Avail: NTIS HC A02/MF A01 CSCL 11/4

The results of provisional measurements are given on the thermal and electrical properties in the temperature range from room temperature down to 2 K of the following composite materials: HERA-type polymer-moulded samarium-cobalt magnets and two kinds of carbon fibre reinforced plastic - the high tensile and the high strength types. The HERA material has a thermal conductivity typical of a heavily-loaded composite and an electrical conductivity which is typical of a metallic alloy. The carbon fibre thermal conductivity both perpendicular and parallel to the fibres is exceedingly low at helium temperatures but it increases rapidly as room temperature is approached. Its electrical resistance increases slightly down to 20 K but it decreases as the temperature is further reduced. The thermal expansion of carbon fibre composite has been measured down to 20 K. On cooling it expands in the direction of the fibre axis but it contracts perpendicular to the axis and this suggests a method of making a material of high dimensional stability. Author (GRA)

N77-30187# Honeywell, Inc., Minneapolis, Minn. Systems and Research Center.

EROSION RESISTANT AR COATINGS FOR IR WINDOWS Final Report, Dec. 1976 - Feb. 1977

W. W. Doerffler, H. Y. B. Mar, T. Boord, and J. Brown 23 Feb. 1977 75 p
(Contract F33615-76-C-5039)
(AD-A039805; HONEYWELL-75RC15; AFML-TR-77-8) Avail: NTIS HC A04/MF A01 CSCL 11/3

Feasibility of rain erosion resistance of two layer AR coatings on ZnS small sample windows with good surface finish has been demonstrated. When exposed to 1 inch/hour simulated rainfalls for 20 minutes at a relative drop impact velocity of 470 mph, transmission losses of about 10 percent occurred. Author (GRA)

N77-30188# Massachusetts Univ., Amherst.

THE INFLUENCE OF EXTRUSION TEMPERATURE ON THE PROPERTIES OF ULTRADRAWN POLYETHYLENE

S. Kojima and Roger S. Porter 1 Jun. 1977 21 p refs
(Contract N00014-75-C-0686)
(AD-A040305; TR-5) Avail: NTIS HC A02/MF A01 CSCL 11/9

In recent years, many studies have been made in this and other laboratories on the solid state extrusion of thermoplastics. The influence of extrusion conditions on the properties of the resultant fibers and films has not, however, been well examined and understood. A systematic study has thus been made to evaluate the influence of conditions for the extrusion of high density polyethylene. In this paper, extrusion temperature is the principal variable of evaluation. The temperature range for crystal formation prior to extrusion was held to a narrow range (132-136 C) Related variables of molecular weight and draw ratio are discussed in detail in related studies. Author (GRA)

N77-30189# Massachusetts Univ., Amherst. Materials Research Lab.

THE PREPARATION AND TENSILE PROPERTIES OF POLYETHYLENE COMPOSITES

W. T. Mead and Roger S. Porter 1 Jun. 1977 42 p refs
(Contract N00014-75-C-0686)
(AD-A040306; TR-6) Avail: NTIS HC A03/MF A01 CSCL 11/9

One polymer composites have been prepared using different morphologies of polyethylene as matrix and as the reinforcement. Depending on annealing conditions, the ultraoriented fibers used as reinforcement can have higher melting points (approx. 139 C) than the matrix made from the same conventionally-crystallized high density polyethylene (approx. 132 C) or from low density polyethylene (approx. equal to 110 C). The optimum temperature has been assessed for bonding to occur by growth of transcrystalline regions from the melt matrix without considerable modoulus reduction of the annealed ultra-oriented and reinforcement fiber of film. Pullout tests have been used for determining the interfacial shear strength of these one polymer composites. The interfacial shear strength for the high density polyethylene films embedded in a low density polyethylene matrix is 7.5 MPa and is 17 MPa for high density polyethylene self-composites. These values are greater than the strength for glass-reinforced resins. The strength is mainly due to the unique epitaxial bonding which gives greater adhesion than the compressive and radial stresses arising from the differential shrinkage of matrix and reinforcement. The tensile modulus of composites prepared from uniaxial and continuous high density polyethylene films embedded in low density polyethylene obeys the simple law of mixtures and the reinforced low density polyethylene modulus increased by a factor of ten. High strength crossply high density polyethylene/low density polyethylene laminates have also been prepared and the mechanical properties have been studied as the film orientation is varied with respect to the tensile axis. Author (GRA)

N77-30190# Southwest Research Inst., San Antonio, Tex.

INVESTIGATION OF FIRST PLY FAILURE IN GRAPHITE/EPOXY LAMINATES SUBJECTED TO BIAXIAL STATIC AND FATIGUE LOADINGS Final Technical Report, 15 Feb. 1975 - 15 Mar. 1977

Philip H. Francis, David E. Walrath, and Donald N. Weed Jun. 1976 64 p refs
(Contract F33615-75-C-5115)
(AD-A040823; AFML-TR-77-62) Avail: NTIS HC A04/MF A01 CSCL 11/4

Thin graphite/epoxy (0/90)s and (+ or - 45)s tubes were

loaded in various combinations of tension, torsion, and internal pressure, and physical evidence of first ply failure (FPF) was found using replication techniques. The FPF envelopes so identified were compared with ultimate strength envelopes, and with lamination theory predictions using a maximum strain criterion. Preliminary experiments were performed to examine the consequences of fatigue cycling inside of, and across the FPF envelope. Author (GRA)

N77-30191# Rensselaer Polytechnic Inst., Troy, N. Y. Dept. of Mechanical Engineering, Aeronautical Engineering and Mechanics.
A THEORY OF COMPOSITES MODELED AS INTERPENETRATING SOLID CONTINUA
H. F. Tiersten and M. Jahanmir Feb. 1977 71 p refs
(Contract N00014-76-C-0368)
(AD-A036496; TR-19) Avail: NTIS HC A04/MF A01 CSCL 11/4

The differential equations and boundary conditions describing the behavior of a finitely deformable, heat conducting composite material are derived by means of a systematic application of the laws of continuum mechanics to a well-defined macroscopic model consisting of interpenetrating solid continua. Each continuum represents one identifiable constituent of the N-constituent composite. The influence of viscous dissipation is included in the general treatment. Although the motion of the combined composite continuum may be arbitrarily large, the relative displacement of the individual constituents is required to be infinitesimal in order that the composite not rupture. The linear version of the equations in the absence of heat conduction and viscosity is exhibited in detail for the case of the two-constituent composites. The linear equations are written for both the isotropic and transversely isotropic material symmetries. For the linear isotropic equations both static and dynamic potential representations are obtained, each of which is shown to be complete.GRA

25 INORGANIC AND PHYSICAL CHEMISTRY

Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.

For related information see also *77 Thermodynamics and Statistical Physics*.

N77-30192 Florida Univ., Gainesville.
COMPOSITIONAL ANALYSIS OF GLASS SURFACES AND THEIR REACTION IN AQUEOUS ENVIRONMENTS Ph.D. Thesis
Carlo George Pantano, Jr. 1976 196 p
Avail: Univ. Microfilms Order No. 77-6895

The surface composition of multicomponent silicate glasses was investigated with Auger electron spectroscopy (AES). The method was applied to study aspects of the glass-water reaction. Problems arise when AES is applied to these materials; significant electric fields develop at the surface of the glass sample, commonly producing a migration of mobile cations. Measurements were made to investigate the behavior of alkali ions in the surface of primarily soda-lime-silicate glasses. Exposure of a bulk glass surface to air containing water vapor was found to induce sodium segregation at the surface. It was hypothesized that the increased sodium concentration of the surface resulted from ion exchange between the sodium at the surface and in the subsurface with hydrogen from the adsorbed water vapor. Upon reaction of the glass with static aqueous solution, depth profiles clearly indicate regions at the surface depleted of alkali and alkaline earth species. 'Bioglass', a specially designed invert soda-lime-silicate glass containing a small addition of phosphorous was found, in aqueous solution, to form a surface film rich in calcium and phosphorous oxides. Dissert. Abstr.

N77-30193 South Florida Univ., St. Petersburg.
ENERGY TRANSFER AND KINETIC STUDIES OF ELECTROCHEMILUMINESCENCE OF AROMATIC HYDROCARBONS Ph.D. Thesis
Thomas David SantaCruz 1976 174 p
Avail: Univ. Microfilms Order No. 77-9260

A proposed reaction mechanism is examined for the generation of electrochemiluminescence. The benzoyloxy radical oxidizes a radical aromatic hydrocarbon anion to the neutral species causing the neutral aromatic hydrocarbon to be electronically excited to the triplet energy state. The triplet state molecule then reacts with benzoyl peroxide (BPO) forming the cation radical of the aromatic hydrocarbon. The cation radical undergoes an annihilation reaction with an anion radical producing two neutral molecules of the aromatic hydrocarbon. One of these molecules may be excited to the luninescent singlet state. This mechanism was experimentally tested by observing the electroluminescence patterns for various hydrocarbons. Results indicates that the triplet species undergoes a quenching reaction which does not lead to luminescence and the induced decomposition of BPO and the anion-cation annihilation reaction are diffusion controlled. Dissert. Abstr.

N77-30194 Princeton Univ., N. J.
ELECTRONIC STRUCTURE STUDIES APPLIED TO ORGANIC AND BIOCHEMICAL SYSTEMS Ph.D. Thesis
Carol Ann Deakyne 1977 132 p
Avail: Univ. Microfilms Order No. 77-9976

Ab initio 4-31G calculations were carried out to determine conformational preferences in model trigonal bipyranidal compounds. The origin of bond length changes resulting from substitution of cyclopropane has been investigated via ab initio STO-3G calculations. Comparison of orbital composition, energies and overlap populations of the cyclopropane parent with the substituted molecules shows that the substituent induced charge redistribution in the cyclopropane SS symmetry orbitals shortens the adjacent bonds while the charge redistribution in the cyclopropane SA symmetry orbitals lengthens the opposite bond. The active site mechanism of ribonuclease-A was studied by a semi-empirical method. The electronic roles of His 12, Lys 41, Asn 44, His 119, the 119-120 backbone HN, and Asp 121 in the transphosphorylation stage of the RNase-A mechanism are assigned by combining known experimental facts with electronic structure theory calculations. Dissert. Abstr.

N77-30195 Indiana Univ., Bloomington.
APPLICATION OF THE THEORY OF MOMENTS TO THE INVESTIGATION OF SPECTRAL DENSITIES Ph.D. Thesis
Chris Thomas Corcoran 1977 279 p
Avail: Univ. Microfilms Order No. 77-10981

The theory of moments and the related formalisms of orthogonal polynomials, continued fractions, and Pade approximants are used in the development of approximate spectral densities, and in the evaluation of averages over such densities. The Stieltjes approximate density is obtained from the histogram derivatives of an n-point distribution which reproduces exactly 2n moments of the correct density. By requiring the n-point distribution to reproduce only 2n-1 moments, and thus allowing one point to be predesignated, it is possible to define a continuous approximate distribution, the derivative of which is the Tchebycheff approximate density. The properties of these approximants are investigated, and they are used to image the densities of normal modes for the diatomic chain and the face centered cubic lattice, and the oscillator strength densities of the hydrogen negative ion, helium, and lithium. Dissert. Abstr.

N77-30196# New Mexico Univ., Albuquerque. Civil Engineering Research Facility.
DEVELOPMENT OF HIGH PRESSURE LIQUID CHROMATOGRAPHIC TECHNIQUES Final Report, 1 Dec. 1975 - 30 Jun. 1976
Roy D. Caton, Jr., James R. Matthews, and Edward A. Walters
Tyndall AFB, Fla. AFCEC Oct. 1976 69 p refs
(Contract F29601-76-C-0015)
(AD-A039644; CERF-EE-10; AFCEC-TR-76-26) Avail: NTIS HC A04/MF A01 CSCL 14/2

Development of high pressure liquid chromatography detectors is discussed. Preliminary evaluation of a beta-induced luminescence detector employing a tritium source and operated in a luminescence quenching mode is presented. An ultrasonic velocity detector is described, along with calibration data, complete construction details, and operating instructions. A solid-state

electrode for silver ion detection using a Ag6I4WO4 pellet is described, and calibration data and interference studies are presented. Construction of a beta-induced luminescence detector to be operated in a direct luminescence mode is described. Data for the recovery and preliminary characterization of refractory organics from treated wastewater using an organics-carbon minifilter are presented. The carbon chloroform extract of the minisampler is analyzed using high pressure liquid chromatography, and column parameters providing maximum resolution of components are given in detail. Author (GRA)

N77-30197# Aerospace Corp., El Segundo, Calif. Aerophysics Lab.
ON ELECTRON ATTACHMENT TO HBO2 Final Report
Karl Westberg 30 Dec. 1976 15 p refs
(Contracts F04701-76-C-0077; F04701-75-C-0076)
(AD-A039379; TR-0077(2550-69)-1; SAMSO-TR-77-45) Avail: NTIS HC A02/MF A01 CSCL 07/2

Miller and Gould recently reported measurements in which well-characterized laboratory test flames were seeded with KNO3 and H3BO3. They assume that H3BO3 is rapidly converted within these flames to HBO2. The potassium in KNO3 ionizes, producing free electrons. In this letter, the data are reanalyzed. It is shown that the data are also consistent with the premise that reactions 1 and -1 are equilibrated and that k sub 1 is greater than the value deduced by Miller and Gould. GRA

N77-30198# Utah Univ., Salt Lake City. Dept. of Chemistry.
RATES OF RAPID CHEMICAL REACTIONS Final Report, 1 Dec. 1972 - 31 Jan. 1977
Edward M. Eyring 28 Mar. 1977 32 p refs
(Grant AF-AFOSR-2444-73; AF Proj. 2303)
(AD-A040126; AFOSR-77-0649TR) Avail: NTIS HC A03/MF A01 CSCL 11/3

The kinetic behavior of carbocyanine dyes in low temperature glasses was investigated by a laser flash photolytic technique. Ultrasonic absorption kinetic studies of the complexation of silver (I) ion by thiosulfate anion and of many other cations by several ligands including particularly crown ethers have also been completed. The minicomputerization of a laser Debye-Sears ultrasonic absorption technique proved especially fruitful and led to a similar digitization of an electric field jump kinetic experiment. An investigation of the thermal degradation of a polyperfluoroalkyl ether confirmed earlier conclusions regarding its free radical mechanism. An unique photoacoustic spectroscopy experiment incorporating a piezoelectric transducer in place of a microphone was developed to study titanium metal corrosion. The technique also has potential interest for measuring fluorescence lifetimes of excited states in materials such as neodymium (III) oxide and neodymium laser glass. Author (GRA)

N77-30199# Air Force Geophysics Lab., Hanscom AFB, Mass.
HIGH RESOLUTION SPECTRA OF CO2 IN THE 3500 TO 3770 cm REGION AT 625 K Environmental Research Papers
Hajime Sakai and George A. Vanasse 10 Feb. 1977 28 p refs
(AD-A040746; AFGL-TR-77-0039; AFGL-ERP-592) Avail: NTIS HC A03/MF A01 CSCL 07/2

This report describes results obtained with an interferometer spectrometer of the absorption spectrum of CO2 at a temperature of 625 K. The hot cell used in the measurements is described in detail and low resolution emission data (2/cm) of CO2 at around 500 K are presented. The absorption spectrum from 3500 to 3770/cm of CO2 at 625 K to a resolution of 0.01/cm is presented as well as a simulated spectrum computed using the AFGL line compilation. Author (GRA)

N77-30200# Aerospace Corp., El Segundo, Calif. Aerophysics Lab.
ANALYTICAL PHOTON CATALYSIS: MEASUREMENT OF Bi CONCENTRATIONS TO 10,000 cu cm Interim Report
Gene A. Capelle and David G. Sutton 19 Apr. 1977 16 p refs
(Contract F04701-76-C-0077)
(AD-A040718; TR-0077(2240)-1; SAMSO-TR-77-96) Avail: NTIS HC A02/MF A01 CSCL 07/4

A new analytic technique was developed to determine quantitatively the concentration of gas-phase species at concentrations well below the capabilities of atomic absorption and mass spectroscopy. The method involves injecting an excess of an energetic metastable species, N2 A(superscript 3 Sigma(+) subscript u) in this experiment, into a gas stream containing the species to be measured, Bi in this case. Energy transfer from the metastable to the sample species results in excitation and subsequent rapid emission of light. The intensity of the light emitted at the wavelengths characteristic of the sample species is a function of, and hence a measure of, the concentration. Concentrations as low as 15000/cu. cm. were measured. Greater sensitivity is possible with more efficient optical detection. Author (GRA)

N77-30201# Royal Armament Research and Development Establishment, Fort Halstead (England).
A REVIEW OF POTENTIAL SERVICE APPLICATIONS UTILIZING ARC PLASMA TECHNOLOGY
A. R. Moss and J. A. Sheward Jan. 1977 17 p refs
(RARDE-TR-11/76; BR56680) Avail: NTIS HC A02/MF A01

Due to recent advances in high temperature chemistry and the availability of novel plasma furnace techniques, it is possible to produce a whole new range of materials of widespread service interest especially for explosives and powder metallurgy. Applications are described in the context of chemical origin and comparison with existing technology. Important advantages are foreseen in the availability of very high temperatures for the preparation of products of carefully controlled physical and chemical composition. In particular, the availability of a wide range of distilled powders having a very high specific surface and being quite different in behavior from conventionally produced powders, would seem to offer many new development opportunities. Author (ESA)

N77-30202# National Physical Lab., Teddington (England). Div. of Chemical Standards.
A DISCUSSION OF THE DIFFICULTIES AND ERRORS IN THE REPRESENTATION OF EXCESS GIBBS ENERGY OF MIXING DATA BY COMMON CORRELATING EQUATIONS
J. F. Counsell and C. P. Hicks Nov. 1976 16 p refs
(NPL-Chem-56) Avail: NTIS HC A02/MF A01

Some of the difficulties and errors which may arise when trying to represent excess Gibbs energy of mixing by a number of correlating equations commonly used in chemical engineering practice are presented. The equations chosen are those due to Redlich-Kister, Van Laar, Wilson, non-random two-liquid (NRTL), and UNIQUAC. Testing of these equations was carried out on the data for water plus ethanol representing an important range of aqueous solutions showing positive deviations from ideality as well as the measurements of enthalpies of mixing in the range 298.15 to 383.15 K and of excess Gibbs energies of mixing in the range 303.15 to 363.15 K. Data are given at intervals of 0.05 in mole fraction and at six temperatures. They were fitted to the correlating equations by minimizing residuals in excess Gibbs energy either as individual isotherms or as the total set. ESA

N77-30203# National Physical Lab., Teddington (England). Div. of Chemical Standards.
CORRELATION OF THE BOILING POINTS OF ALKANOLS
D. Ambrose Dec. 1976 19 p refs
(NPL-Chem-57) Avail: NTIS HC A02/MF A01

General schemes for correlating boiling points of alkanols with features which allow estimation of unknown values with error probably not exceeding 5K are presented. The relationship between n (the effective carbon number) and the structure of an alkanol, and the accuracy with which vapor pressure, as expressed by T sub b (normal boiling point) may be calculated from structure are expressed. ESA

N77-30204# National Physical Lab., Teddington (England). Div. of Chemical Standards.
AN EMPIRICAL CORRELATION OF THE SECOND VIRIAL COEFFICIENT OF HYDROCARBONS
I. J. Lawrenson Mar. 1977 15 p refs
(NPL-Chem-62) Avail: NTIS HC A02/MF A01

An empirical equation is given which represents the second virial coefficient of 28 hydrocarbons over a range of temperatures

between 0.8 and 1.3 times the normal boiling temperature of each. Author (ESA)

N77-30205# National Physical Lab., Teddington (England). Div. of Chemical Standards.
THERMOMETRIC REFERENCE MATERIALS
A. S. Lindsey, H. M. Paisley, B. E. Broderick, and Jacqueline M. Ellender Feb. 1977 37 p refs
(NPL-Chem-64) Avail: NTIS HC A03/MF A01

The requirement for thermometric reference materials and the criteria governing their choice are discussed. Some theoretical aspects of the measurement of freezing, melting and triple point temperatures are reviewed. The procedures of purification and certification of the NPL thermometric reference materials are described. Author (ESA)

N77-30206# National Physical Lab., Teddington (England). Div. of Chemical Standards.
REFERENCE MATERIALS AND DATA FOR MEASUREMENT OF VAPOUR PRESSURES, CRITICAL TEMPERATURES AND CRITICAL PRESSURES
D. Ambrose Mar. 1977 28 p refs
(NPL-Chem-67) Avail: NTIS HC A03/MF A01

Recommendations are made of some substances for use as reference materials in the measurement of vapor pressure and of critical temperature and pressure. Tables of the vapor pressures of these substances are given. Author (ESA)

N77-30207# Illinois Univ., Urbana-Champaign. Dept. of Chemistry.
CHEMICALLY INITIATED ELECTRON EXCHANGE LUMINESCENCE. A NEW CHEMILUMINESCENT REACTION PATH FOR ORGANIC PEROXIDES
Gary B. Schuster and Ja-Young Koo 23 May 1977 18 p refs
(Contract N00014-76-C-0745)
(AD-A040099) Avail: NTIS HC A02/MF A01 CSCL 07/2

The thermal decomposition of diphenoylperoxide in the presence of certain aromatic hydrocarbons generates benzocoumarin and light corresponding to the fluorescence spectrum of the hydrocarbon. It is shown that this chemiluminescence does not result from conventional energy transfer from some electronically excited peroxide decomposition product to the aromatic hydrocarbon. Instead, the chemiluminescence is initiated by electron transfer from the hydrocarbon to the peroxide followed by rapid decarboxylation and back electron transfer to form the electronically excited hydrocarbon. The yield of light from this process is quite high. It is suggested that a similar mechanism may be operating in several previously described chemiluminescing systems. Author (GRA)

N77-30208# Brandeis Univ., Waltham, Mass. Dept. of Chemistry.
THE POLYMERIZATION OF NiBr2(P(CH2CH2CN)3)2: A TRIPLY-SPECIFIC SOLID-STATE REACTION
Kent Cheng and Bruce M. Foxman Apr. 1977 15 p refs
(Contract N00014-76-C-0822)
(AD-A039687; TR-1) Avail: NTIS HC A02/MF A01 CSCL 07/2

The solid-state reaction of square-planar NiBr2(P(CH2CH2CN)3)2 has been shown to lead to highly oriented crystals of octahedral polymer. Reaction of the monomer in the solid-state at -5 leads to a product which is characterized by (a) freedom from the usual contaminants arising from reaction in solution; (b) stereospecificity, leading to formation of strictly linear polymer; and (c) topotaxy, in which (a* reactant: a* product), (b* reactant: b*product) are aligned for the orthorhombic reactant and monoclinic product phases. Further, no twinning is observable in the product. There is a negligible volume change involved in the polymerization (approximately 0.3%). Individual single crystals react at -5 with a well-defined front passing across the crystal, virtually parallel to a (100) face. This is consistent with the observation that only the a axis of the reactant crystal must reorient to form the product pseudomorph. Author (GRA)

N77-30209# Aerospace Corp., El Segundo, Calif. Aerophysics Lab.
COLLISIONAL QUENCHING AND RADIATIVE DECAY STUDIES OF NF(A1 DELTA) AND NF(B1 SIGMA PLUS) Interim Report
Munson A. Kwok, John M. Herbelin, and Norman Cohen 15 Apr. 1977 30 p refs
(Contract F04701-76-C-0077)
(AD-A039263; TR-0077(2940)-6; SAMSO-TR-77-73) Avail: NTIS HC A03/MF A01 CSCL 07/2

From these preliminary studies, it was concluded that this system is a chemical electronic laser candidate. Some of the crucial rate coefficients needed for evaluating the system quantitatively and for constructing a model must be measured to assess further this possibility. Among the rate coefficients reported here are that for Reaction and those for the quenching of NF by H and H2. The radiative decay rate for NF is estimated. The effects of HF(0), D2, and D on NF are discussed. GRA

N77-30210# National Bureau of Standards, Washington, D. C. Physical Chemistry Div.
A SECOND APPRAISAL OF METHODS FOR ESTIMATING SELF-REACTION HAZARDS Final Report, Jan. - Dec. 1975
Eugene S. Domalski Mar. 1977 160 p refs
(PB-266925/7; NBSIR-76-1149; DOT-MTB-OHMO-7616)
Avail: NTIS HC A08/MF A01 CSCL 07A

Test data on hazardous materials which undergo selfdecomposition were collected. Test methods were evaluated through a literature survey. Using a computerized predictive scheme, a hazard evaluation was conducted on a selected group of compounds normally considered safe. In a study of accidental polymerization of bulk chemicals, free radical polymerization involving olefins was considered the polymerization process most likely to occur inadvertently during transport. GRA

N77-30211# New Hampshire Univ., Durham. Water Resources Research Center.
FULVIC ACID-METAL ION INTERACTIONS IN WATER Completion Report
James H. Weber and Stephen A. Wilson 1977 52 p refs
(Contract DI-14-31-0001-3829)
(PB-267597/3; RR-14; W77-08102; OWRT-A-035-NH(2))
Avail: NTIS HC A04/MF A01 CSCL 07D

Fulvic and humic acids isolated from the B2 horizon of a Podzol soil obtained at Conway, N.H. and isolated from the Oyster River (Lee, N.H.) were characterized. The corrections for dissociation of fulvic acid were determined by a theory which utilizes the equivalents per gram and the acid dissociation constants of the fulvic acid samples. The solid state and aqueous solution electron spin resonances (esr) spectra of the aquatic and soil fulvic and humic acids was analyzed. It was concluded that semiquinone free radicals predominate in fulvic acid. A decrease in spin concentration at a potential of 0.20 volts (vs. SCE) demonstrates that the semiquinone radicals are at least partially responsible for the reducing capability of humic materials. GRA

26 METALLIC MATERIALS

Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

N77-30212 Syracuse Univ., N. Y.
THRESHOLD AND NEAR THRESHOLD FATIGUE CRACK PROPAGATION IN AIR AND DRY AND WET ARGON Ph.D. Thesis
Julius Anthony Mautz 1976 113 p
Avail: Univ. Microfilms Order No. 77-9877

From the environmental tests, effects were noted in the near threshold region but none were observed on delta Kth. For D6ac steel room air produced the highest crack propagation rate while dry and wet argon produced identical but lower crack propagation rates for the same delta K values. For 7050T-73651 aluminum both wet argon and room air environments produced high fatigue crack growth rates while dry argon produced lower rates. Changing the test frequency from 375 Hz to 100 Hz had no noticeable effect on the threshold and near threshold region results for D6ac steel in room air but in dry argon

100 Hz gave slightly higher crack propagation rates than 375 Hz. A few tests were also conducted with regard to crack closure. Two new techniques, a compliance derivative and a crack opening displacement derivative, were used which showed to be very sensitive. The role of closure is also discussed. Dissert. Abstr.

N77-30213 Iowa State Univ. of Science and Technology, Ames.
DIRECTIONAL GROWTH OF PEARLITE IN IRON-CARBON EUTECTOID ALLOYS Ph.D. Thesis
David Dwight Pearson 1976 131 p
Avail: Univ. Microfilms Order No. 77-10332

Pearlite was transformed directionally by passing a zone of austenite through high purity Fe-C alloy bars of eutectoid composition. The temperature gradient at both the austenitizing edge and the pearlite transformation edge of the austenitic zone was recorded. A sharp change in gradient occurred due to the change in thermal conductivity between the phases at each interface. It was found that the undercooling of the pearlite transformation interface below the eutectoid temperature was quadratically dependent on the velocity of transformation. Interlamellar spacing maesurements of pearlite showed an inverse quadratic dependence of spacing on velocity. Volume diffusion of carbon through austenite adequately describes the kinetics of the decomposition of austenite to pearlite. The interlamellar spacing of pearlite and the pearlite transformation interface temperature as a function of velocity are compared to other constant velocity transformation studies as well as isothermal investigations. Dissert. Abstr.

N77-30214 Pennsylvania Univ., Philadelphia.
PHASE TRANSFORMATIONS AND ANNEALING BEHAVIOR IN AMORPHOUS Fe-P-C ALLOYS Ph.D. Thesis
Helen Shih-Wei Li Yeh 1976 245 p
Avail: Univ. Microfilms Order No. 77-10238

The annealing behavior and the nature of the crystallization Fe-P-C amorphous alloys and positional effects on crystallization were examined. Iron based alloys were selected because of their interesting mechanical and magnetic properties. The low temperature annealing behavior was studied by resistivity measurements which showed that the structure change started at 100 C corresponding to the relaxation or relief of strain built up during quenching. A second change at 220 C is believed to be either due to a second relaxation process or incipient crystallization. Prolonged annealing was studied by heating the Fe80P13C7 amorphous alloy at 300 C for about 13 days. Transmission electron microscopy revealed the transformed structures as being comprised of structureless areas and iron crystalline areas. Dissert. Abstr.

N77-30215# Syracuse Univ., N. Y. Dept. of Chemical Engineering and Materials Science.
THE RELATIONSHIPS BETWEEN THE TRANSFORMATION CHARACTERISTICS AND THE FRACTURE AND FATIGUE PROPERTIES OF TRIP STEELS AND OTHER METASTABLE AUSTENITIC STEELS Final Report
Volker Weiss, K. Schroder, P. Sherman, and A. Pan Jan. 1977 63 p
(Contract DAAG46-75-C-0065)
(AD-A039670; AMMRC-CTR-77-1) Avail: NTIS HC A04/MF A01 CSCL 11/6

The present study was aimed at obtaining further information on the inter-relationship between the microstructural, composition, and the mechanical variables. Of particular interest were the stress-strain-martensite relations for various strain rates, the effect of stress state on these relationships, and the kinetics of martensite formation under fatigue conditions. Unfortunately, TRIP steel was only available in wire form. Thus only the uniaxial tensile tests and the rotating beam fatigue tests were conducted on this material. The effects of strain rate on tensile strength and elongation for TRIP steel wires were determined by the manufacturer and are also reported here (appendix). To obtain the effect of stress state on the strain-martensite-ductility relationships in metastable austenitic alloys, tests were conducted on type 301 stainless steel and on AM-355 CRT steel. While these steels do not achieve the strength level of TRIP steels, it is believed that the results can be used as a guide to estimate the stress state effects on TRIP steel. GRA

N77-30216# Clarkson Coll. of Technology, Potsdam, N.Y.
AN EXPERIMENTAL STUDY OF MAGNETIC MATERIALS AND MAGNETIC TRANSITIONS Final Technical Report, 1 Jul. 1970 - 30 Jun. 1976
Elmer E. Anderson and Sigurds Arajs 30 Jun. 1976 86 p refs
(Contract N00014-76-C-0051)
(AD-A039898) Avail: NTIS HC A05/MF A01 CSCL 20/3

The most important accomplishments of this project are the development of a new method for the determination of critical indices; the determination of critical indices for Europium, Rutetium and Yttrium Iron Garnets, and nickel-copper alloys; the emergence of a unified correlation between the Neel temperatures and anomalies in the electrical transport properties of numerous binary chromium alloys; the new studies of the behavior of localized magnetic moment in itinerant electron antiferromagnetic; the partial mapping of the magnetic phase diagram of the gadolinium-samarium system; and the demonstration of the existence of localized magnetic moments in paramagnetic nickel and binary nickel alloys at high temperatures. Author (GRA)

N77-30217# Naval Research Lab., Washington, D. C. Engineering Materials Div.
OPTIMIZING CRACK: GROWTH RESISTANCE IN ENGINEERING ALLOYS Final Report
T. W. Crooker 18 Apr. 1977 16 p refs
(RR0220146)
(AD-A039579; NRL-8110) Avail: NTIS HC A02/MF A01 CSCL 11/6

Designers often cannot prevent cracking in machinery components or structural members. Uncontrollable factors such as undetected manufacturing defects and unforeseen service conditions can initiate cracking that affects safety, reliability, and maintenance. One way designers can compensate for these is in selection of alloys for optimum crack-growth resistance. Enhancement of crack-growth resistance is now an active area of material research. This report summarizes recent information that can help design engineers with problems involving stress-corrosion cracking and fatigue crack growth. Author (GRA)

N77-30218# George Washington Univ., Washington, D.C. School of Engineering and Applied Science.
DETERMINATION OF CYCLIC NONLINEAR ENERGY TOUGHNESS FOR 7075-T6 ALUMINUM SHEETS Final Technical Report
P. K. Poulose, D. L. Jones, and H. Liebowitz Dec. 1976 23 p refs
(Contract N00019-76-C-0151)
(AD-A039639) Avail: NTIS HC A02/MF A01 CSCL 11/6

In this report, the nonlinear energy method for fracture toughness determination has been applied to cyclic loading conditions. The nonlinear energy toughness for cyclic loading, G(fc), was obtained from an envelope of the cyclic load-displacement record for thin center-cracked sheet specimens of 7075-T6 aluminum alloy. A cyclic loading program, in which each succeeding load peak approached the static load in an exponential manner, was applied to these specimens. With constant specimen dimensions, different load increments were used for different specimens, which resulted in varying cyclic lives. The specimens used in these tests exhibited a significant reduction in G(fc) with increasing cyclic life in a manner analogous to the classical S-N diagram. This reduction in life for 7075-T6 was significantly less than for 2024-T3, which had been evaluated previously although 2024-T3 has considerably higher toughness. Author (GRA)

N77-30219# Naval Air Development Center, Warminster, Pa. Air Vehicle Technology Dept.
EFFECT OF HYDROGEN CONTENT ON EMBRITTLEMENT AND STRESS CORROSION SUSCEPTIBILITY OF Ti-8Al-1Mo-1V ALLOY Progress Report
Rocco N. Ricci 17 Nov. 1972 18 p refs
(AD-A039244; NADC-72205-VT) Avail: NTIS HC A02/MF A01 CSCL 11/6

The phase of this Independent Research Project dealt with the affect of cathodic charging on Ti-8Al-1Mo-1V alloy. This method is used as a comparison to the hydrogen absorption that occurs in the chemical processing of this alloy. Cantilever

beam specimens were used in testing for K(I) - K(I)SCC values (stress intensity values). Author (GRA)

N77-30220# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Metallurgy and Materials Science.

ALUMINIDE COATING ON DIRECTIONAL GAMMA PRIME/DELTA EUTECTICS

Homi C. Bhedwar, Richard W. Heckel, and David E. Laughlin May 1977 21 p refs

(Contract N00014-76-C-0198)

(AD-A040116; TR-1) Avail: NTIS HC A02/MF A01 CSCL 11/3

The relationships between the process variables and the coating microstructure were studied for aluminide-coated gamma prime/delta directional eutectics. A spectrum of coating microstructures was obtained depending on the choice of the process variables. The process variables were the aluminizing and homogenizing temperatures, the homogenizing time and the activity of aluminum in the coating pack. The microstructures were described with reference to the Ni-Al-Nb ternary phase diagram and the diffusion of the aluminum and the nickel atoms. Author (GRA)

N77-30221# Aeronautical Research Council, London (England). Structures Dept.

EFFECT OF INTERSPERSED PERIODS OF HEATING ON FATIGUE CRACK INITIATION AND PROPAGATION IN CM001 (RR58) CLAD SHEET

F. E. Kiddle Jul. 1976 33 p refs Supersedes RAE-TR-76092 and ARC-37041

(AD-A041014; ARC-CP-1366; RAE-TR-76092; ARC-37041) Avail: NTIS HC A03/MF A01 CSCL 11/6

Fatigue tests have been conducted to study the effect of interspersed periods of heating on the initiation and early growth of cracks from holes in clad sheet and also on later stages of crack propagation. The tests were under flight simulation loading and the material was CM001 (RR58) clad aluminium alloy sheet. Interspersed heating reduced the lives to initiate and grow cracks to 2mm and this is attributed to the softening of strain hardened material at the crack tip, but no effect was observed for longer crack lengths. When load was applied during the periods of heating creep redistribution of local stress retarded the growth of short and long cracks. Further work is underway to investigate fatigue-heat interactions under different load-temperature sequences, other forms of material, and over a wider range of crack lengths. Author (GRA)

N77-30222# Army Armament Research and Development Command, Watervliet, N. Y. Benet Weapons Lab.

EFFECT OF QUENCHING TECHNIQUES UPON GUN STEEL

E. H. Niccolls May 1977 25 p refs

(AD-A040800; ARL-CB-MR-77-026) Avail: NTIS HC A02/MF A01 CSCL 11/6

The effects of a water, oil and 400 F salt quench upon mechanical properties and microstructure of a 2-in. thick block of gun steel were studied. The 400 F salt quench was found to be the mildest quenchant. The water and oil quenching effects were compared to the empirical predictions of Grossman with good qualitative agreement. Author (GRA)

N77-30223# Michigan Technological Univ., Houghton. Dept. of Metallurgical Engineering.

ON SLIP AND YIELDING OF ALLOYS WITH LAMELLAR MICROSTRUCTURES

Donald A. Koss and Kwai Chan Jun. 1977 15 p refs

(Contract N00014-76-C-0037)

(AD-A040971; TR-7) Avail: NTIS HC A02/MF A01 CSCL 11/6

The flow behavior of an alloy with a two-phase lamellar microstructure is analyzed. Based on the model presented, the macroscopic slip system and the yield strength are controlled by the ability of a slip system, once activated in the softer phase, to shear the plate-like harder phase. This ability to shear is controlled by the capacity of a specific slip system, together with the applied stress, to generate sufficient shear stress through the thickness of the harder phase to cause macroscopic flow. The yield stress and active macroscopic slip plane of an individual Widmanstatten colony of alpha-beta Ti alloy are analyzed to demonstrate the model. Comments are also made regarding the deformation of and crack formation in pearlitic steels in terms of the proposed model. Author (GRA)

N77-30224# Aluminum Co. of America, Alcoa Center, Pa.

EXPLORATION OF THE FEASIBILITY OF PRODUCTION ROLLING AN OPTIMUM ALUMINUM ALLOY SYSTEM WHICH HAS AN AS-WELDED YIELD STRENGTH OF 30 KSI MINIMUM Final Technical Report, 22 Jan. 1974 - 22 Jul. 1976

Ralph W. Rogers, Jr., William D. Vernam, and M. Byron Shumaker 22 Sep. 1976 87 p refs

(Contract N00024-74-C-5241)

(AD-A040712; Rept-56-AC227) Avail: NTIS HC A05/MF A01 CSCL 11/6

A high-strength weldable Al-Mg alloy, CS19, was fabricated into plate from large ingots on production rolling mills to evaluate feasibility. Plate in 6.3 mm (.250-in.) and 25.4 mm (1.0-in.) thicknesses was produced from two commercial sizes of ingot with no difference in product characteristics observed between plates fabricated from either size ingot. Tests on 25.4 mm thick CS19 plate and weldments showed it to have as-welded minimum yield strength of 207 MPa (30 ksi) and corrosion and fracture toughness equivalent to or better than 5456-H116 or H117 alloys. CS19 plate was shown to have more rapid rate of stress-corrosion crack growth than 5456 under some conditions but equal resistance to SCC initiation. The thinner plate and weldments had higher strength but lower toughness which was equivalent to that of 5456 of the same thickness. SCC resistance of the thinner plate and weldments was also good except for SCC resistance of weldments after thermal treatments simulating long service times. Greater strain in thinner plate produced an HAZ structure susceptible to SCC after thermal treatment. Author (GRA)

N77-30225# Naval Intelligence Support Center, Washington, D. C.

ON THE NATURE OF THE ANISOTROPY OF THE MECHANICAL PROPERTIES OF HOT-ROLLED TITANIUM ALLOY PLATE

G. S. Kazakevich 27 Apr. 1977 18 p refs Transl. into ENGLISH from the book "Machines and Technology of Metal Working by Pressure", Leningrad, Machinostroyeniye Publishing House, 1966 p 56-61

(AD-A040440; NISC-TRANS-3929) Avail: NTIS HC A02/MF A01 CSCL 11/6

In this work use was made of the dilatometric method involving a mathematical statistical analysis of the change in the linear thermal expansion coefficient as a function of the orientation of specimens in 12 directions in the three main planes of plate No. 1, which had a striated macrostructure of the alpha-alloy Ti-Al after hot rolling and ordinary annealing. The anisotropy of the mechanical properties of this plate was cited in reference. The coefficient alpha ten to the minus 6th power was measured in six temperature intervals from 20-100 to 20-600 C on a differential dilatometer of the Cheveneau system with DR-49 type photo-recording. The measurements were made on two specimens for each orientation. GRA

N77-30226# Case Western Reserve Univ., Cleveland, Ohio. Dept. of Metallurgy and Materials Science.

OBSTACLE-INDUCED HARDENING AND SOFTENING IN METALLIC MATERIALS Technical Progress Report, 1 Feb. 1976 - 31 Jan. 1977

R. Gibala, V. K. Sethi, and R. Fournier 31 Oct. 1976 27 p refs

(Contract AT(11-1)-1676)

(COO-1676-44) Avail: NTIS HC A03/MF A01

During the past contract year results were obtained in two on-going project areas: surface oxide softening and solute gradients in niobium and tantalum, and mechanical properties of Nb-H, Nb-D and Nb-O-H alloys. The important results include: (1) characterization of the large softening and ductilizing effect of niobium and tantalum caused by thin (50-100 nm) surface oxide films; determination of the role of interstitial impurities in the strengthening and ductility changes caused by hydrogen and

deuterium in niobium; and observation of hydride precipitate softening in niobium. ERA

N77-30227# Argonne National Lab., Ill. Materials Science Div.

FATIGUE CRACK MORPHOLOGY IN 304 STAINLESS STEEL CYCLED AT CONSTANT STRESS AMPLITUDE

A. P. L. Turner 1977 10 p refs Presented at 4th Intern. Conf. on Fracture, Waterloo, Canada, 19-24 Jun. 1977

(Contract W-31-109-eng-38)

(CONF-770601-1) Avail: NTIS HC A02/MF A01

Cracks are nucleated at coarse slip bands, and microstructural features such as inclusions and grain boundaries are not important either as sites of initiation or as obstacles to propagation. One of the major effects of stress amplitude is that the number of cracks nucleated increases rapidly in part because increasing the stress amplitude increases the number of grains which contain coarse slip bands, but there is sufficient data to determine if the crack density increases simply in proportion to the slip-band density or if the slip bands also become more intense and more likely to nucleate cracks at the higher stress amplitudes. The increased density of cracks appears to have significant consequences for the crack propagation process because link up of independently nucleated cracks becomes a prominent mode of propagation along the surface at the higher stress amplitudes. ERA

N77-30228# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Cologne (West Germany). Inst. fuer Werkstoff-Forschung.

INFLUENCE OF MICROSTRUCTURE ON FATIGUE CRACK PROPAGATION RATE OF ALUMINUM ALLOYS Ph.D. Thesis - Ruhr Univ.

Joachim Albrecht (Ruhr Univ.) and Gerd Luetjering 15 Mar. 1977 76 p refs In GERMAN; ENGLISH summary Report will also be announced as translation (ESA-TT-418)

(DLR-FB-77-07) Avail: NTIS HC A05/MF A01; DFVLR, Cologne DM 40.30

The influence of microstructure on fatigue crack propagation rate was investigated for three different AlZnMgCu-alloys with similar tensile properties. Tests were performed under vacuum and in laboratory air to estimate the influence of environment. A pronounced influence of microstructure on crack propagation rate was found for fatigue under vacuum as well as in air. Crack propagation along slip bands in a high-purity underaged alloy exhibited the slowest, crack propagation by void coalescence in commercial alloys the highest crack propagation rate. At low rates a strong tendency for crack propagation along slip bands was observed. The quantitative investigation of the plastic zone ahead of the crack tip showed a very narrow region of high deformation followed by a long-range zone of low deformation. The effect of environment proved to be dependent on the micromechanism of crack propagation. Author (ESA)

N77-30229# Aluminum Co. of America, Alcoa Center, Pa. Alcoa Technical Center.

PROGRAM TO DEVELOP HIGH STRENGTH ALUMINUM POWDER METALLURGY MILL PRODUCTS. PHASE 4B-SCALE-UP TO 3200 LB BILLET Final Report, Jun. 1972 - Feb. 1976

W. S. Cebulak 25 Apr. 1977 136 p refs

(Contract DAAA25-72-C-0593)

(AD-A039862; FA-TR-76067) Avail: NTIS HC A07/MF A01 CSCL 11/6

High strength aluminum powder metallurgy mill products have been scaled up to plate, extrusions, and forgings from 1545-kg (3400-lb) billets. The scale-up process started with atomized alloy powder, which was preheated and vacuum hot pressed to fully dense billets for further production mill fabrication to plate, extrusions, and die forgings. Engineering properties of these products indicate that P/M plate duplicated property capability of small-scale lab-produced plate, developing 13% higher strength, equal toughness, 30-50% higher notched fatigue strength, and superior corrosion and stress corrosion compared to existing commercial I/M alloys. Scaled-up P/M extrusions and die forgings were weaker than earlier, lab-scale products but still developed superior stress corrosion resistance and 30 to 80% higher notched fatigue strength compared to existing commercial alloys. An Alcoa-funded follow-on study is in progress to develop billet processing and product fabrication variations leading to duplicating properties of lab-scale P/M products for all billet sizes and all products. A report on that study will be distributed when completed. Author (GRA)

N77-30230# Naval Postgraduate School, Monterey, Calif.

AN INVESTIGATION OF THE RECOVERY PROCESSES IN 7075-T651 ALUMINUM RESPONSIBLE FOR A STRESS DECAY DURING DYNAMIC LOADING HISTORIES M.S. Thesis

Richard Allen Bentley Mar. 1977 102 p refs

(AD-A039653) Avail: NTIS CSCL 11/6

This thesis investigates stress relaxation, strain softening, strain hardening and anelastic behavior as potential recovery processes in 7075-T651 aluminum alloy. A series of tests were conducted utilizing specimens of 7075-T651 aluminum alloy as a representative aircraft structural materials. The tests utilized both single and dual amplitude cyclic loading histories. The recovery mechanism felt to cause the observed stress decay was represented as an exponential decay due to an anelastic strain recovery behavior. GRA

N77-30231# Aluminum Co. of America, Alcoa Center, Pa. Alcoa Technical Center.

STUDY OF IMPROVED ALUMINUM MATERIALS FOR VEHICULAR ARMOR Final Report, Jun. 1973 - Jun. 1975

J. F. Vruggink 7 Apr. 1977 182 p refs

(Contract DAAA25-73-C-9657; DA Proj. 1X6-63620-DG-20)

(AD-A039488; FA-TR-76073) Avail: NTIS HC A09/MF A01 CSCL 11/6

An Intermediate Thermal Mechanical Treatment (ITMT), consisting of warm rolling at 500 F followed by a recrystallization treatment, produced a fine-grained, relatively equiaxed, recrystallized structure in 7475 plate. Alloy 7475-T6 plate having this recrystallized structure (AR) had slightly lower strengths and fracture toughness and higher ductility (tensile reduction in area) than laboratory or commercial hot rolled 7475-T6 plate having an unrecrystallized structure. Alloy 7475-T6, similarly processed to a fine-grained, recrystallized structure, then hot rolled 25% at 750 F (AR and HR) had (1) strengths similar to laboratory and commercial hot rolled 7475-T6 plate, (2) fracture toughness similar to commercial hot rolled 7475-T6 plate but slightly lower than laboratory hot rolled 7475-T6 plate, and (3) ductility higher than laboratory or commercial hot rolled 7475-T6 plate. The fracture toughness of both the recrystallized (AR) and the recrystallized plus hot rolled (AR and HR) 7475-T6 plate was significantly higher than the fracture toughness of conventionally processed commercial 7075-T651 plate. Application of Final Thermal Mechanical Treatment (FTMT) practices to 7475 plate produced strength/toughness relationships generally superior to that of 7075-T651 plate. Author (GRA)

N77-30232# Naval Research Lab., Washington, D. C.

COOPERATIVE RADIATION EFFECTS SIMULATION PROGRAM Semiannual Progress Report, 1 Apr. - 31 Aug. 1976

L. A. Beach and L. E. Steele Feb. 1977 74 p refs

(AD-A039192; NRL-MR-3456) Avail: NTIS HC A04/MF A01 CSCL 11/6

The Cooperative Radiation Effects Simulation Program (CORES) is a collaborative effort of the Engineering Materials and Radiation Technology Divisions of the NRL Materials and General Sciences Area. The goal of the research is to provide the theoretical and experimental bases for understanding the mechanisms of void nucleation, as well as a theoretical insight into energy deposition processes. In this the Van de Graaff and Cyclotron are used to simulate rapidly the radiation damage produced over long operating periods in reactor neutron environments. Progress for the period 1 April - 31 August 1976 includes the continuation of studies on the stability of Ni3A1 precipitates in nickel under Ni58(+) ion bombardment. Specimens examined by transmission electron microscopy after irradiation at different dose levels and dose rates showed a modification of the precipitate structure. The precipitate size distribution in the high level, high dose rate specimens decreased in size but increased in density. In the low level, low dose rate specimens, the precipitates developed contrast features but

retained their size distribution. In another study a computer program was developed to convert the size of an arbitrary projection of a polyhedral void to a characteristic edge length for the void. These edge lengths can be used to calculate void volumes from the correct formula for each void shape. The microstructure of cold worked, high purity nickel has been investigated following ion-simulated irradiation-induced creep with 22-Me-V alpha particles. GRA

N77-30233# Naval Postgraduate School, Monterey, Calif.
A SCANNING ELECTRON MICROSCOPE STUDY OF THE CORROSION OF SACRIFICIAL HULL ANODES UNDER SIMULATED SHIP SERVICE CONDITIONS M.S. Thesis
Peter Warren Wright Dec. 1976 154 p refs
(AD-A039345) Avail: NTIS HC A08/MF A01 CSCL 13/10

The behavior of ship hull sacrificial anode zinc was studied under simulated shipboard exposure conditions. The adherence and passivating tendencies of anodic corrosion products are discussed in relation to time and corrosion product layer thickness. The effects of velocity and time of dynamic exposure on zinc anode specimens pre-exposed statically are presented. The behavior of zinc corrosion products is related to laminar and turbulent regimes of electrolyte flow as well as ionic diffusion. The depassivating tendencies of zinc anode corrosion products are presented. The corrosion of an aluminum sacrificial anode is characterized, and the observed widespread pitting corrosion is hypothesized to be anti-intergranular in nature. Author (GRA)

N77-30281*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
EVALUATION AND CONTROL OF ENVIRONMENTAL CORROSION FOR ALUMINUM AND STEEL ALLOYS
D. B. Franklin *In its* Proc. of the ASPE/MSFC Symp. on Eng. and Productivity Gains from Space Technol. May 1977 p 137-147 (For primary document see N77-30273 21-31)
Avail: NTIS HC A13/MF A01 CSCL 11F

27 NONMETALLIC MATERIALS

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.

N77-30234 Rutgers - The State Univ., New Brunswick, N. J.
MAGNESIUM NITRATE ADDITIONS TO A HIGH ALUMINA DIELECTRIC Ph.D. Thesis
Barry Keven Speronello 1976 152 p
Avail: Univ. Microfilms Order No. 77-7285

The removal of paraffin wax binder from a high alumina ceramic during firing is examined. Differential thermal analysis, thermogravimetric analysis, gas chromatography, and infrared absorption spectrophotometry were used to study the burnout reactions. After a short period of rapid combustion binder removal was limited to the volatilization of unreacted or incompletely oxidized hydrocarbons by sluggish diffusion of oxygen into the green ceramic. Low heating rates favored the evolution of partially oxidized hydrocarbons, while high heating rates produced larger amounts of unreacted effluents. Dissert. Abstr.

N77-30235 Illinois Univ., Urbana-Champaign.
APPLICATIONS OF LASER LIGHT SCATTERING SPECTROSCOPY TO BIOPOLYMERS Ph.D. Thesis
Tilak Raj 1976 145 p
Avail: Univ. Microfilms Order No. 77-9152

The general theoretical and experimental aspects of laser light scattering are considered. The effect of the concentration of a polymer (uncharged as well as charged) on its diffusion coefficient is discussed in detail. A diffusion study of a very interesting molecule, bovine serum albumin (BSA), as a function of protein concentration, ionic strength, and pH of the solution is described. It is shown that the molecule undergoes an actual expansion (as all the past studies suggest) when the pH is lowered below the isoelectric point. The molecule does not expand significantly when the ionic strength is lowered. All the apparent changes in the diffusion coefficient are explained in terms of the charge present on the polyelectrolyte in a low salt solution (charge effect). The determination of the molecular weight of a membrane enzyme, pyruvate oxidase (PO) is discussed. Preliminary results of miscellaneous studies are given. Dissert. Abstr.

N77-30236* National Aeronautics and Space Administration. Pasadena Office, Calif.
ALDEHYDE-CONTAINING UREA-ABSORBING POLYSACCHARIDES Patent
William A. Mueller (JPL), George C. Hsu (JPL), and Harold E. Marsh, Jr., inventors (to NASA) (JPL) Issued 9 Aug. 1977 4 p Filed 15 Mar. 1976 Supersedes N76-26278 (14 - 17, p 2165) Sponsored by NASA
(NASA-Case-NPO-13620-1; US-Patent-4,041,233; US-Patent-Appl-SN-666992; US-Patent-Class-536-56; US-Patent-Class-210-24; US-Patent-Class-536-58; US-Patent-Class-536-84; US-Patent-Class-536-536-85; US-Patent-Class-536-105) Avail: US Patent Office CSCL 11I

A novel aldehyde containing polymer (ACP) is prepared by reaction of a polysaccharide with periodate to introduce aldehyde groups onto the C2 - C3 carbon atoms. By introduction of ether and ester groups onto the pendant primary hydroxyl solubility characteristics are modified. The ACP is utilized to absorb nitrogen bases such as urea in vitro or in vivo.
Official Gazette of the U.S. Patent Office

N77-30237* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
METHOD OF PREPARING ZINC ORTHOTITANATE PIGMENT Patent
Daniel W. Gates, Yoshiro Harada (IIT Research Inst., Chicago), William R. Logan (IIT Research Inst., Chicago), and John E. Gilligan, inventors (to NASA) (IIT Research Inst., Chicago) Issued 2 Aug. 1977 4 p Filed 17 Jun. 1976 Supersedes N76-26285 (14 - 17, p 2166)
(NASA-Case-MFS-23345-1; US-Patent-4,039,347; US-Patent-Appl-SN-696989; US-Patent-Class-106-292; US-Patent-Class-106-296; US-Patent-Class-106-299) Avail: US Patent Office CSCL 11C

Zinc orthotitanate suitable for use as a pigment for spacecraft thermal control coatings is prepared by heating a slightly zinc deficient reaction mixture of precipitated oxalates of zinc and titanium. The reaction mixture can be formed by coprecipitation of zinc and titanium oxalates from chloride solution or by mixing separately precipitated oxalates. The mixture is first heated to 400 to 600 C to remove volatiles and is then rapidly heated at 900 to 1200 C. Zinc orthotitanate produced by this method exhibits the very fine particle size needed for thermal control coatings as well as stability in a space environment.
Official Gazette of the U.S. Patent Office

N77-30238 Pennsylvania State Univ., University Park.
THE TEMPERATURE DEPENDENCE OF HYPERSOUND IN FOUR POLYACRYLATES Ph.D. Thesis
Andrew B. Romberger 1976 146 p
Avail: Univ. Microfilms Order No. 77-9721

Temperature dependence of hypersonic sound speed dispersion and absorption was investigated in polymethylacrylate, polyethylacrylate, poly-n-propylacrylate and poly-n-butylacrylate by means of Brillouin scattering. Prepared samples were placed in a temperature controlled environment. The scattered light spectrum from a helium-neon laser was analyzed by a Fabry-Perot interferometer, designed to operate in a triple pass configuration. Sound speeds were determined from the measurement of frequency shifts of Brillouin components relative to the unshifted central component of the scattered light spectrum.
Dissert. Abstr.

N77-30239 North Carolina State Univ., Raleigh.
PROPERTIES OF FIBROUS MORPHOLOGIES OF POLY (ETHYLENE TEREPHTHALATE) PREPARED BY HIGH-PRESSURE EXTRUSION IN A CAPILLARY DIE Ph.D. Thesis
Phillip Dwight Griswold 1976 163 p
Avail: Univ. Microfilms Order No. 77-11145

The convergent entrance region to a capillary die was used to prepare fibrous morphologies of poly(ethylene terephthalate) melts. Poly(ethylene terephthalate) segments were prepared by high-pressure extrusion in an Instron capillary rheometer at

temperatures from 245 C to 265 C. The extrusion rate was a sensitive function of time, temperature, and lubrication conditions. Wide-angle X-ray measurements of crystalline orientation along the axis of long-growth segments showed conclusively that the mechanisms of segment formation as well as segment properties were controlled by the time-dependent crystallization of polymer melt in the rheometer barrel. Toroidal crystalline aggregate remnant was discovered in capillary dies removed from the rheometer after the occurrence of oscillating flow. Based upon the rehological and structural evidence, a mechanism of crystalline toroid formation is proposed. Dissert. Abstr.

N77-30240 Pennsylvania State Univ., University Park.
THE STRUCTURE AND PROPERTIES OF PHOSPHAZENES Ph.D. Thesis
Robert W. Allen 1976 212 p
Avail: Univ. Microfilms Order No. 77-9520

Various aspects of the synthesis and characterization of cyclic and polymeric phosphazene compounds were investigated. Significant advances were made in the following areas: the conformational analysis of phosphazene polymers, the synthesis and characterization of platinum derivatives of cyclic and polymeric phosphazenes, the study of molecular motions in phosphazene clathrate inclusion compounds, and the polymerization of phosphazenes in the presence of siloxanes. Dissert. Abstr.

N77-30241# Stanford Univ., Calif. Dept. of Chemistry.
PRELIMINARY STRUCTURAL CHARACTERIZATION OF PLASMA POLYMERIZED PERFFLUOROBUTENE-2
Cecile Naar and John I. Brauman [1977] 44 p refs
Avail: NTIS HC A03/MF A01

The molecular structure of PFB-2 plasma polymer coating is characterized. Structural analysis results based on 19F NMR spectra, molecular weight determination, elemental analysis, and infrared spectra are presented. The mechanisms of reaction in plasma polymerization are examined. Synthesis of new products with important applications is emphasized. Author

N77-30242*# Monsanto Research Corp., Dayton, Ohio. Dayton Lab.
EXPLORATORY STUDY ON THE EFFECTS OF NOVEL DIAMINE CURING AGENTS AND ISOCYANATE PRECURSORS ON THE PROPERTIES ON NEW EPOXY AND URETHANE ADHESIVES Final Report
D. Gerald Glasgow and Clayborn Garthwait May 1977 33 p refs
(Contract NAS1-13982)
(NASA-CR-145227; MRC-DA-678) Avail: NTIS HC A03/MF A01 CSCL 11A

Aromatic diamines based on diphenyl sulfone and benzophenone were studied as epoxy adhesive curing agents. Previously found differences in adhesive strengths for meta vs para orientation were not found in these series. The use of aluminum and alumina as fillers in a m,m prime-methylene dianiline-cured epoxy adhesive was not found to be beneficial to adhesive strength. Alumina filled adhesives had much lower strength than unfilled adhesives. The unfilled m,m prime-methylene dianiline-based epoxy adhesive had excellent resistance to moisture relative to a p,p prime-methylene dianiline-based adhesive and maintained good strengths up to 250 F. A glass fiber composite based on a m,m prime-methylene dianiline-cured epoxy appeared to be equivalent to the p,p prime-methylene dianiline-cured epoxy as judged by short beam shear tests. Author

N77-30243# Southwest Research Inst., San Antonio, Tex. Army Fuels and Lubricants Research Lab.
DETERMINATION OF SYNTHETIC HYDROCARBONS IN HYBRID MINERAL OIL LUBRICANTS Interim Report
L. L. Stavinoha Jan. 1977 15 p refs
(Contract DAAG53-76-C-0003)
(AD-A039964; AFLRL-86) Avail: NTIS HC A02/MF A01 CSCL 11/8

An analytical gas chromatographic procedure has been developed to qualitatively and quantitatively detect polyalpha olefins such as oligomers of decene-1 in hybrid mineral oil lubricants. The polyalpha olefin synthetic hydrocarbons used in hybrid lubricants are narrow boiling compounds producing specific peaks as compared to the broad range Gaussian type distribution of mineral oils. Difficult base line definition and undetectable components such as C60 oligomers produce errors which are acceptable even if larger than desired. Author (GRA)

N77-30244# Monsanto Research Corp., Dayton, Ohio.
FLAME AND SMOKE RETARDANT POLYMER SYSTEMS Quarterly Report, Aug. - Oct. 1976
Leo Parts and Catherine A. Thompson 26 Apr. 1977 63 p refs
(Contract N00024-76-C-5336)
(AD-A039367; QR-2) Avail: NTIS HC A04/MF A01 CSCL 11/3

Experimental smoke-retardant PVC compositions and a reference base polymer were coated with alkyd- and epoxy-based intumescent paints. Specimens were tested in an NBS smoke density chamber under flame and nonflame exposure conditions. The smoke optical density, and the concentrations of CO, CO2, NOx, hydrocarbons, hydrogen chloride and oxygen were monitored during these tests. Although the coatings reduced smoke formation from the base polymer, they had an adverse effect on the performance of the smoke-retardant compositions. The commercial coatings used in this work were found to generate significant quantities of smoke. Other, recently developed coatings will be used in projected work. The intumescent coatings reduced the rates of carbon monoxide and hydrogen chloride formation, especially under nonflame exposure to a radiant energy source. The coatings contributed small amounts of nitrogen oxides to the combustion products. Author (GRA)

N77-30245# Rock Island Arsenal, Ill.
RESIN BONDED MOLD AND DIE PRODUCTION TECHNOLOGY Final Report
J. Ronald Russell Nov. 1976 27 p refs
(AD-A039826; AOD-TR-76-003) Avail: NTIS HC A03/MF A01 CSCL 11/9

The objective of this program was to develop low-cost techniques using commercially available epoxy resins to produce molds and dyes for small-sized, short-run plastic parts, rubber parts, and investment casting patterns. Efforts to produce epoxy molds and acceptable injected wax patterns were successful. Attempts to produce epoxy molds for plastic injection were only marginally successful, as very few acceptable components could be produced in these dyes. However, expertise is commercially available for the fabrication of epoxy tooling for plastic injection. Techniques for the successful fabrication of rubber compression molds and rubber components were established by earlier efforts. Resin bonded mold fabrication substantially reduces tooling costs and lead time for short run and prototype work. Author (GRA)

N77-30246# Alabama Univ., University. Dept. of Chemistry.
VINYL POLYMERIZATION OF ORGANOMETALLIC MONOMERS CONTAINING TRANSITION METALS
Charles U. Pittman, Jr. 25 May 1977 12 p refs
(Contract N00014-75-C-0689)
(AD-A040818; TR-18) Avail: NTIS HC A02/MF A01 CSCL 07/3

This report provides a general review of the vinyl monomers, containing transition metals, which have been prepared and polymerized. The reactivity of such monomers in addition to homo- and copolymerizations is described. The Q-e scheme is used to semiemperically classify the vinyl reactivity of several organometallic monomers. Author (GRA)

N77-30247# National Physical Lab., Teddington (England). Div. of Chemical Standards.
A SUMMARY APPRAISAL OF ENGINEERING CERAMICS
T. I. Barry Nov. 1976 17 p
(NPL-Chem-58) Avail: NTIS HC A02/MF A01

Factors affecting the availability, cost, and performance of engineering ceramics are reviewed in relation to potential applications. Main emphasis is made on high performance ceramics for mechanical engineering, silicon carbide, silicon nitride and sialons, but reference is also made to glass-ceramics and more traditional oxides and silicates in order to set the nitrides and carbides in perspective. ESA

N77-30248# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Inst. fuer Strukturmechanik.

EXPERIMENTAL AND THEORETICAL STRESS ANALYSIS OF A FIBER REINFORCED PLASTIC TENSILE SPECIMEN CONTAINING A HOLE

Rainer Schuetze and Hoshang Kharadi 11 Mar. 1977 24 p refs In GERMAN; ENGLISH summary Report will also be announced as translation (ESA-TT-417)

(DLR-FB-77-06) Avail: NTIS HC A02/MF A01; DFVLR, Cologne DM 13.80

The stress distribution in a glass fiber reinforced plastic tensile specimen containing a hole was calculated and investigated experimentally. The deformations in the vicinity of the hole were measured by holographic interferometry and computed by the finite element method. The stresses resulted from measured and computed deformations. Comparison gave a good agreement between measurement and computed values. Author (ESA)

N77-30249# Boeing Commercial Airplane Co., Seattle, Wash.

EXPLORATORY OF DEVELOPMENT OF DURABILITY OF ADHESIVE BONDED JOINTS Final Report, 1 Feb. 1974 - Oct. 1976

J. A. Marceau and J. C. McMillan Oct. 1976 160 p refs

(Contract F33615-74-C-5065; AF Proj. 7381)

(AD-A039864; D6-41317-2; AFML-TR-76-173) Avail: NTIS HC A08/MF A01 CSCL 11/4

The objectives of the program were to evaluate stressed durability test methods, to use these methods to test adhesive bonding materials and processes, and to develop a correlation between laboratory test results and in-service performance. The test method evaluation was completed early in the program and results were published in an interim technical report, AFML-TR-75-3, Durability of Adhesive Bonded Joints, February 1975. Four stressed durability test methods were selected for the test program: (1) A thick-adherend lap-shear specimen (Mode I and Mode II loading); (2) A thick-adherend double cantilever beam (DCB) specimen (Mode I loading); (3) A thin adherend DCB specimen (wedge test, Mode I loading); and (4) A thick adherend single cantilever beam (SCB) specimen for honeycomb sandwich evaluation (Mode I and Mode II loading). Alloy, adherend surface treatment, adhesive primer, and adhesive interactions were evaluated. The materials and processes used were: (1) Alloys: 2024-T3, 2024-T3 clad (1230 alloy), 7075-T6, and 7075-T6 clad (7072 alloy); (2) Adhesives: FM 123-2 and EA 9628 250 F curing adhesives, and AF 143 and PL 729-3 350 F curing adhesives; (3) Primers: BR 123 non-corrosion-inhibiting primer, BR 127 corrosion-inhibiting primer, and EC 3917 and PL 728 corrosion-inhibiting primers for use with the two 350 F curing adhesives; (4) Adherend surface treatment processes: Optimized FPL etch, chromic acid anodize, and phosphoric acid anodize; and (5) Aluminum honeycomb core: Standard core, Dura-Core and CR III corrosion-resistant cores, and phosphoric acid anodized core. GRA

N77-30250# Army Materials and Mechanics Research Center, Watertown, Mass.

NONDESTRUCTIVE TESTING OF RUBBER PRODUCTS USED BY THE ARMY Final Report

Walter R. Klappert Jan. 1977 12 p refs

(AD-A039319; AMMRC-MS-77-1) Avail: NTIS HC A02/MF A01 CSCL 11/10

This paper is a survey of the field of rubber and rubber testing leading to a discussion of the nondestructive testing of rubber products used by the Army. It includes a primer on rubber itself, a review of physical tests, and concludes with a survey of rubber-related nondestructive testing research. Author (GRA)

N77-30251# Harry Diamond Labs., Adelphi, Md.

CURE STUDIES AND CURED PROPERTIES OF DIGLYCIDYL ETHER OF 4-METHYLORESORCINOL (A RAPID-GELLING EPOXY RESIN)

Allan B. Goldberg, Sheng Yen Lee, and Keith C. Bruce May 1977 25 p refs

(AD-A039998; HDL-TR-1808) Avail: NTIS HC A02/MF A01 CSCL 11/9

Curing was studied of diglycidyl ether of 4-methylolresorcinol (DGEMR), a rapid-gelling epoxy resin synthesized at the Harry Diamond Laboratories. The epoxy, with a built-in catalytic methylol group, can be cured with all types of conventional epoxy hardeners including aliphatic and aromatic amines, anhydrides, polyamidoamines, and polymercaptans. In general, DGEMR gels up to 30 times faster than the regular bisphenol A-type epoxy resins and 2 to 5 times faster than the fastest-gelling commercial epoxies known. Cures with flexible hardeners such as polyamidoamines and polyoxyalkyleneamines were rapid even at -7C. Hardening with m-phenylenediamine was complete at room temperature. Adhesion to aluminum obtained with DGEMR formulations was approximately 50 percent greater than that produced by the conventional bisphenol A-type epoxy. Thus, DGEMR appears to be ideal for adhesive, coating, and low-temperature cure applications, as well as for filled formulations without prolonged gel times. However, the methylol substituent appears to enhance water absorption and results in slightly lower electrical resistivity. Author (GRA)

N77-30252# Monsanto Research Corp., Dayton, Ohio. Dayton Lab.

FLAME-AND SMOKE-RETARDANT POLYMER SYSTEMS Quarterly Report, Nov. 1976 - Jan. 1977

Leo Parts, Robert D. Myers, and Norman F. May 23 May 1977 39 p refs

(Contract N00024-76-C-5336)

(AD-A039915; QR-3) Avail: NTIS HC A03/MF A01 CSCL 11/9

Experimental neoprene rubber compositions were prepared to investigate the feasibility of reducing smoke formation and improving other fire performance characteristics with incorporated additives. Specimens were tested in an NBS smoke density chamber under flame and nonflame exposure conditions. The smoke optical density and the concentrations of CO, CO2, NOx, hydrocarbons, hydrogen chloride and hydrogen cyanide were monitored during these tests. Ferric acetylacetonate by itself and in combination with poly(ammonium phosphate) reduced smoke optical density generated from neoprene foam under flame exposure conditions by approximately 10%. Cupric acetylacetonate, another candidate char formation catalyst evaluated in this work, catalyzed thermal degradation of the neoprene foam. Ferric acetylacetonate catalyzed the formation of CO under nonflame exposure conditions. This catalytic effect was destroyed by incorporating poly(ammonium phosphate) with ferric acetylactonate. Crosslinking catalysts more effective than those used in the presently reported work are needed to reduce smoke formation from neoprene foam significantly. GRA

N77-30253# Aberdeen Univ. (Scotland). Dept. of Chemistry.

NITRILE POLYMERISATION AND HETEROCYCLIC SYNTHESIS USING IMINYLS Final Technical Report

R. H. Thomson 31 Mar. 1977 24 p

(Grant DA-ERO-76-G-301)

(AD-A039606) Avail: NTIS HC A02/MF A01 CSCL 07/3

Three types of iminyl radical bearing a -nitrile group have been investigated as models for the suggested radical-initiated polymerisation of the nitrile groups in polyacrylonitrile. The iminyls were generated by oxidation of the corresponding oxime-O-acetic acids with persulphate and it has been shown that the most appropriate model iminyls are those derived from keto-nitriles possessing a t-alkyl nitrile group, an unhindered carbonyl and some degree of molecular rigidity. Three important homolytic reactions are thought to occur during polymerisation of polyacrylonitrile, viz, intramolecular addition of iminyl to nitrile, intramolecular hydrogen abstraction by the iminyl, and formation of iminyl by intramolecular addition of alkyl radical to nitrile. The second of these has been shown to occur readily with some of the above models. Author (GRA)

N77-30254# Massachusetts Univ., Amherst. Polymer Research Inst.

DIMENSIONAL CHANGES IN ULTRADRAWN POLYETHYLENE

Numa J. Capiati and Roger S. Porter 1 Jun. 1977 25 p refs

(Contract N00014-75-C-0686)

(AD-A040442; TR-7) Avail: NTIS HC A02/MF A01 CSCL 11/9

Samples of ultradrawn high density polyethylene were studied by thermo-mechanical analysis. The purpose was to study the dimensional changes in polyethylene morphologies of extreme

orientation. Dimensional changes were measured from -140 C to +70 C with a precision of better than 1%. A negative thermal expansion coefficient was observed along the length (c axis) of the fibers containing the polyethylene morphologies of extreme orientation. A change in negative coefficient is observed between -35 and -45 C. The sign and magnitude of the expansion coefficient confirms, along with other evidence, the existence of extended chain structures in these morphologies. A series parallel model has been developed for the ultradrawn polyethylenes to describe the dimensional changes with temperature. Author (GRA)

N77-30255# Battelle Columbus Labs., Ohio.
EVALUATION OF THE CALCIUM ALUMINATE BOND PHASE IN REFACTORY CASTABLES AS RELATED TO THEIR USE IN SYNTHANE GASIFIER
D. R. Lankard, J. H. Peterson, and C. W. Kistler Dec. 1976 72 p refs
(Contracts Di-BM-JO-155086; E(49-18)-2219)
(PB-266854/9; BM-OFR-85-77) Avail: NTIS HC A04/MF A01 CSCL 11B

The effects of exposing a dense, high alumina castable and a low iron insulating castable to a simulated coal gasification reactor environment for up to 100 hours and at temperatures up to 2,000F are described. The castables were characterized by chemical analyses, X-ray diffraction, scanning electron microscopy, and strength measurements. Changes in the castables were related to mineralogical and microstructural changes. GRA

N77-30256# Steel Structures Painting Council, Pittsburgh, Pa.
SURFACE PROFILE FOR ANTI-CORROSION PAINTS Final Report
Joan D. Keane, Joseph A. Bruno, and Raymond E. F. Weaver 30 Jun. 1976 167 p refs Sponsored by Federal Highway Admin., and Penn. Dept. of Transportation, Am. Inst., of Steel Construct., Am. Iron and Steel Inst., Federation of Soc. for Coatings Technol. and Steel Plate Fabricators Assoc.
(PB-266946/3; FHWA-PA-71-14; PDT-71-14) Avail: NTIS HC A08/MF A01 CSCL 11F

Scanning electron microscopy and related techniques (especially in 3-D stereo) made it possible to visualize, for the first time, the true topography of structural steel surfaces cleaned by various methods and to reconstruct the probable mechanism of profile formation. A proposed specification was developed for a standard method of measuring profile by optical microscopy. The effects of the major surface preparation parameters on profile were established, including type of abrasive, size of abrasive, degree of blast cleaning, type of equipment, angle of impingement, steel thickness, peak count, and steel variation. GRA

N77-30257# Oklahoma State Univ., Stillwater. School of Civil Engineering.
DESIGN AND PROOF TEST REQUIREMENTS FOR PRECAST REINFORCED CONCRETE BOX CULVERTS Final Technical Report
Hussam M. F. Ghanem and John P. Lloyd Mar. 1977 103 p refs Sponsored jointly by Federal Highway Admin. and Okla. Dept. of Transportation, Oklahoma City
(PB-267297/0; Pub-R(S)-6; FHWA-RD-77-S0613) Avail: NTIS HC A06/MF A01 CSCL 13C

The accuracy of a proposed proof test for single cell box culverts was verified by testing 16 full size specimens. The measured strength was compared to that predicted by yield line theory. It was shown that for culverts reinforced with welded wire fabric, the plastic moment capacity should be based on the tensile strength of the wire. For culverts reinforced with deformed bars, the plastic moment could be based on the yield strength of the reinforcement. An ancillary study involving 24 beams considered the influence of reinforcement style on the width of flexural cracks under sustained loading conditions. It was found that deformed bars provided significantly better crack control than smooth welded wire fabric. GRA

N77-30282*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
POLYURETHANE ADHESIVE WITH IMPROVED HIGH TEMPERATURE PROPERTIES
James M. Stuckey *In its* Proc. of the ASPE/MSFC Symp. on Eng. and Productivity Gains from Space Technol. May 1977 p 149-152 (For primary document see N77-30273 21-31)
Avail: NTIS HC A13/MF A01 CSCL 11A

N77-30283*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
POTENTIALLY IMPROVED GLASSES FROM SPACE ENVIRONMENT
Ronald Nichols *In its* Proc. of The ASPE/MSCF Symp. on Eng. and Productivity Gains from Space Technol. May 1977 p 153-157 (For primary document see N77-30273 21-31)
Avail: NTIS HC A13/MF A01 CSCL 11B

N77-30285*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
FERROLUBRICANTS
Ann Whitaker *In its* Proc. of the ASPE/MSFC Symp. on Eng. and Productivity Gains from Space Technol. May 1977 p 165-169 (For primary document see N77-30273 21-31)
Avail: NTIS HC A13/MF A01 CSCL 11H

N77-30286*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
PROCESSING ON HIGH EFFICIENCY SOLAR COLLECTOR COATINGS
Marion Roberts *In its* Proc. of the ASPE/MSFC Symp. on Eng. and Productivity Gains from Space Technol. May 1977 p 171-176 (For primary document see N77-30273 21-31)
Avail: NTIS HC A13/MF A01 CSCL 11D

28 PROPELLANTS AND FUELS

Includes rocket propellants, igniters, and oxidizers, storage and handling; and aircraft fuels.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power,* and *44 Energy Production and Conversion.*

N77-30258 Princeton Univ., N. J.
IGNITION AND OTHER UNSTEADY COMBUSTION PHENOMENA INDUCED BY RADIATION Ph.D. Thesis
Luigi DeLuca 1977 262 p
Avail: Univ. Microfilms Order No. 77-9977

Ignition and transient combustion characteristics of several ammonium perchlorate composite propellants and several nitrocellulose double base propellants were classified by their responses to strong radiant heating from laser and arc sources. The minimum exposure time to the external radiant flux required for ignition was measured in the pressure range from 5 to 21 atm using either nitrogen or air as the pressurizing gas. The experimental portion of this investigation showed that radiative sources were not suitable for rating solid rocket propellant ignitability due to the interfering effects of solid propellant optical transparency, slow chemical kinetics in the cool gas phase near the surface, combustion dynamics during the radiation termination interval, and nonuniform spatial distribution of impinging radiation. Dissert. Abstr.

N77-30259 Wayne State Univ., Detroit, Mich.
AN EXPERIMENTAL STUDY SUPPORTED BY A COMPUTER SIMULATION IN A PRECHAMBER CFR DIESEL ENGINE LEADING TO A MODIFIED CETANE SCALE FOR RATING LOW IGNITION QUALITY FUELS Ph.D. Thesis
Nabil Youssef Elias 1976 319 p
Avail: Univ. Microfilms Order No. 77-9392

The current ASTM cetane scale was investigated as a criterion to rate low ignition quality diesel fuels. An evaluation of the effect of raising compression ratio on gas temperature indicated that while the increase in compression ratio beyond a critical ratio greatly affects the pressure, it has an insignificant effect on gas temperature. A study of the effect of gas pressure and temperature on ignition delay period showed that the effect of increasing the gas temperature on ignition delay was much more than the effect of increasing the gas pressure. It was concluded that raising compression ratio does not extend the current cetane scale for C.N. below 15. Dissert. Abstr.

N77-30260# Tyco Labs., Inc., Pomona, Calif. General Nucleonic's Div.

AUTOMATED M9 PROPELLANT QUANTITY GAGE

D. W. Blincow, S. C. Dominey, and J. H. McCormick 30 Apr. 1976 72 p

(Contract DAAA21-73-C-0300)

(AD-A039106; PATR-0211-01) Avail: NTIS HC A04/MF A01 CSCL 19/1

This report describes the construction and operation of the Automated M9 Propellant Quantity Gage (AMPQG). The purpose of the AMPQG is to measure the quantity of propellant powder sealed within the 40 mm cartridge cases at a production rate of one per second. The gage uses a radioactive source of Americium 241, a scintillation detector and digital electronics to measure the propellant by a backscatter technique. The accept/reject decision level is set at 80% propellant fill, but due to te statistical nature of the signal source, cartridges with more or less than 80% propellant are accepted or rejected on a probability basis. The requirements for the AMPQG are: (1) Not more than one cartridge can be accepted out of one million tested at 55% fill. (2) Not more than one cartridge rejected out of five hundred tested at 100% fill. The gage was acceptance-tested at Milan Army Ammunition Plant in March 1976. The test results and recommendations for future gage construction are presented in this report. Author (GRA)

N77-30261# RAND Corp., Santa Monica, Calif.

THE POTENTIAL ROLE OF TECHNOLOGICAL MODIFICATIONS AND ALTERNATIVE FUELS IN ALLEVIATING AIR FORCE ENERGY PROBLEMS Interim Report

J. R. Gebman, W. L. Stanley, J. P. Weyant, and W. T. Mikolowsky Dec. 1976 170 p refs

(Contract F49620-77-C-0023)

(AD-A039597; R-1829-PR) Avail: NTIS HC A08/MF A01 CSCL 21/4

This report examines short- and long-term measures to reduce the consumption of petroleum jet fuels by the Air Force. Engine retrofits and aerodynamic modifications to existing aircraft can save significant quantities of jet fuel; however, savings in fuel expenditures are not enough to offset high initial costs of engine retrofits. If accomplished early in an aircraft's life cycle, relatively lower costs of modest aerodynamic modifications may be recoverable through savings in fuel expenditures. Synthetic JP fuels derived from oil shale or coal appear to be the most attractive future alternatives to petroleum jet fuels. If the foreign oil cartel maintains its price-setting effectiveness and synthetic fuels industry develops in the United States, development of an Air Force capability to interchangeable use fuels derived from crude oil, oil shale, or coal could be economically attractive and enhance the Air Force's position in the jet fuel marketplace.

Author (GRA)

N77-30262# Naval Weapons Center, China Lake, Calif.

CINEPHOTOMICROGRAPHY AND SCANNING ELECTRON MICROSCOPY AS USED TO STUDY SOLID PROPELLANT COMBUSTION AT NAVAL WEAPON CENTER Summary Report, 1963 - 1976

Thomas L. Boggs, James E. Crump, Karl J. Kraeutle, and Donald E. Zurn May 1977 52 p refs

(AD-A040211; NWC-TP-5944) Avail: NTIS HC A04/MF A01 CSCL 19/1

This report discusses cinephotomicrography and scanning electron microscopy, and how these techniques have been used by investigators studying solid propellant combustion. The elements required for taking and using high speed, high magnification motion pictures - cameras, lenses, window bombs, light sources, timers, hot-stage microscopes, motion analyzers - are discussed. The principles and equipment needed for scanning electron microscopy are also discussed. GRA

N77-30263# Hazards Research Corp., Denville, N.J.

DETONATION PROPAGATION TESTS ON AQUEOUS SLURRIES OF RDX, HMX, M-1 AND NITROCELLULOSE

George Petino, Jr., Darl Westover (Army Armament Res. and Develop. Command, Dover, N. J.), and Robert Scola Apr. 1977 66 p ref

(Contract DAAA21-73-C-0772)

(AD-A040221; ARL-CD-CR-77-002) Avail: NTIS HC A04/MF A01 CSCL 19/1

The objective of this program was to investigate the detonation propagation characteristics of aqueous slurries of RDX, HMX, M-1 and two types of nitrocellulose in 2 inch, schedule 40, stainless steel pipes of various lengths. Two operational modes were studied; the dynamic or pumping mode and, the static, or settled slurry mode. The dynamic condition was simulated by adding an inert gelling agent to a homogeneous, aqueous, explosive slurry. Author (GRA)

N77-30264# Army Armament Research and Development Command, Dover, N. J. Large Caliber Weapon Systems Lab.

THE EFFECT OF AN ELECTRIC FIELD ON SENSITIVITY OF PRIMARY EXPLOSIVES

Maurice S. Kirshenbaum Jun. 1977 34 p refs

(DA Proj. 1L6-62617-AH-79)

(AD-A040620; ARL-CD-TR-77-026) Avail: NTIS HC A03/MF A01 CSCL 19/1

The electrostatic hazard of handling primary exposives (RD1333 lead azide, dextrinated lead azide, basic lead styphnate, and tetracene) due to their exposure to electric fields was evaluated. The study showed that RD1333 lead azide became slightly more sensitive electrostatically after a particular sequence of voltage applications. The average electric field strength required to initiate explosion in pressed, dextrinated lead azide was a function of the density and thickness of the wafers, and varied from 37 to 73 kV/cm. This was generally less than the dielectric breakdown strength of air. It was demonstrated that the initiation of the pressed, dextrinated lead azide could not be solely due to bulk Joule heating but also involved an electric field effect. Author (GRA)

N77-30265# California Univ., Livermore. Lawrence Livermore Lab.

NEW BOOSTER EXPLOSIVE, LX-15(RX-28-AS)

H. A. Golopol, D. B. Fields, and G. L. Moody 20 Dec. 1976 28 p refs

(Contract W-7405-eng-48)

(UCRL-52175) Avail: NTIS HC A03/MF A01

A new booster explosive LX-15 based on hexanitrostilbene (HNS) is described. Formulation is comparable to PBX 9407 in performance in the slapper detonator, but with better thermal properties, and safer handling characteristics. The advantages of using HNS are as follows: (1) high melting point, (2) relative insensitivity in handling; and (3) allowability as an in line explosive. ERA

N77-30266# Ogden Air Logistics Center, Hill AFB, Utah. Propellant Lab. Section.

EVALUATION OF PROPELLANT-LINER-INSULATION SAMPLES REPRESENTING STAGE II MOTORS AA21010, AA21015, AA21032 AND AA21053 Semiannual Report

Elizabeth M. Dalaba Oct. 1976 29 p

(AD-A039755; MANCP-357(74)) Avail: NTIS HC A03/MF A01 CSCL 21/9

This report covers the testing of selected lined cartons of ANB-3066 propellant which were also tested by Aerojet Solid Propulsion Company (ASP). Comparisons are made with data from ASPC and reference to prior testing by Ogden ALC is included. No definitive conclusions have been reached at this time. The necessity for continued testing has been established which includes chemical as well as physical tests. The statistical discussion is presented in the appendix to this report.

Author (GRA)

N77-30267# Naval Ship Research and Development Center, Bethesda, Md.

THE ENTHALPIES OF DISTILLATE FUELS BY A DIFFERENTIAL SCANNING CALORIMETRIC METHOD

John G. Zimmerman May 1977 36 p refs

(SF54593502)

(AD-A039655; DTNSRDC-77-0049) Avail: NTIS HC A03/MF A01 CSCL 21/4

The enthalpy differences and heat capacities of five Navy Distillate fuels, one Diesel Fuel Marine, and one JP-5 fuel were determined in the temperature range -15 to +25 C (5 to 77 F) with a differential scanning calorimeter. Enthalpy differences and heat capacities were determined to a standard deviation of about

4%. The differential scanning calorimeter method also provided a means of estimating wax contents and wax formation temperatures to + or - 2 C. The method is proposed as a quick and reasonably accurate means of determining the enthalpy differences of fuels over the temperature region appropriate to low-temperature fuel handling. Author (GRA)

N77-30268# Cambridge Univ. (England). Cavendish Lab.
MECHANICAL PROPERTIES OF ENERGETIC MATERIALS Final Technical Report, Jul. 1976 - Jan. 1977
D. Tabor, J. E. Field, M. M. Chaudi, H. M. Hauser, and R. G. Patel Jan. 1977 55 p refs
(Grant DA-ERO-75-G-008)
(AD-A039600) Avail: NTIS HC A04/MF A01 CSCL 19/1

This report discusses observations made which emphasize the importance of the mechanical properties of explosive samples in various initiation situations, and describes work on the drop-weight impact test, micro-particle initiation of explosives and stab-initiation. One of the main features of the drop-weight experiments was the use of high-speed photography to follow the many processes which take place before initiation. It was found that the sample may undergo plastic flow in bulk, show evidence of partial melting, and even (with PETN) melt completely. Initiation, when it took place, always did so after failure of the sample. In the micro-particle impact experiments the possiblity of localized plastic flow was assessed; flow concentration by adiabatic shear was shown to be important during particle-impact initiation of some explosives. Experiments in which a conical strike initiated samples of primary explosives showed that the initiation mechanism was frictional: a model is presented which allows the temperatures generated during impact to be estimated. Section 3, describes three approaches which were used to study the frictional properties of a range of explosives, including PETN, HMX, RDX, silver azide and lead azide. GRA

N77-30269# Wisconsin Univ., Madison. Dept. of Mechanical Engineering and Statistics.
NITROGEN OXIDE CONTROL WITH THE DELAYED-MIXING, STRATIFIED-CHARGE ENGINE CONCEPT Technical Report, 10 Nov. 1975 - 9 Nov. 1976
L. W. Evers, P. S. Myers, and O. A. Uyehara Jul. 1976 267 p refs
(Grant EPA-R-803858-01-0)
(PB-267633/6; EPA-460/3-76-022) Avail: NTIS HC A12/MF A01 CSCL 21D

Methods of controlling the nitrogen oxide emissions from internal combustion engines were studied. From computer calculations, the delayed mixing stratified charge engine concept was selected. In the delayed mixing stratified charge engine concept, combustion is initiated and completed in a fuel-rich region, then air is mixed into those rich products. A single cylinder engine was modified to include an air injection valve. When air was injected after rich combustion, the nitrogen oxide emissions were lower, the hydrocarbon emissions were lower, the carbon monoxide emissions were about the same, and the efficiencies were lower than for homogeneous operation at the same overall fuel-air ratio. GRA

31 ENGINEERING (GENERAL)

Includes vacuum technology; control engineering; display engineering; and cryogenics.

N77-30270 Stanford Univ., Calif.
ON-STREAM PARTICLE-SIZE ANALYSIS BY A DYNAMIC EQUILIBRIUM SIEVING METHOD Ph.D. Thesis
Ti-hua Chin 1976 118 p
Avail: Univ. Microfilms Order No. 76-7068

An on-stream method for measuring particle size in a wet grinding circuit has been developed. This method is based on a dynamic equilibrium between the undersized particles in the sample upstream from a replacable sieve and those in the reference stream below the same sieve. By continuously measuring and comparing the mass concentrations in both slurry streams, the fraction of material in the sample stream which is finer than the separating sieve size can be determined. A transfer rate equation for sieving single-size particles was derived. The solids' concentrations in the slurry, (pulp densities) of any given undersized particles in the two streams are related, at equilibrium, through an equilibrium constant, K. Empirically, this constant is nearly independent of size. The mass fraction of undersized solids in the sample stream is related to the total pulp densities in the two streams. By knowing the equilibrium constant, K, a continuous measurement of mass fraction of undersized solids in the measured slurry can be determined. Dissert. Abstr.

N77-30271*# National Bureau of Standards, Washington, D.C.
FIRE RESEARCH SPECIALISTS: A DIRECTORY
Nora H. Tason Jul. 1977 137 p
(NASA Order C-97823-B)
(NASA-CR-135089; NBSIR-77-1264) Avail: NTIS HC A07/MF A01 CSCL 13L

Specialists are listed from the United States and Canada who have made recent contributions to the fire literature, to the teaching of fire science or related subjects, or who have participated in or supported fire research programs. This work is an update of the 'Directory of Workers in the Fire Field'. The Directory is divided into three parts. The first part, the Specialists Index, is arranged alphabetically. The first line notes the name followed by the area(s) of specialization represented by Arabic numerals. These Arabic numerals are used throughout the Directory and are defined in a separate listing on page vii. The second and subsequent lines give the specialist's affiliation, mailing address, and telephone number. The second part, the Subject Specialty Index, alphabetically lists the subject areas and the corresponding specialist names. Entries are limited to two areas of specialization per individual. The third part, The Affiliation Index, alphabetically lists the corporate sources, noting the specialists therein. If a specialist was affiliated with an organization, the term 'Consultant' was used to group these individuals in the Affiliations Index. Author

N77-30272*# National Aeronautics and Space Administration. Goddard Inst. for Space Studies, New York.
AN ACTIVE THERMAL COMPENSATOR FOR CLOSED-CYCLE HELIUM REFRIGERATORS
Donald E. Jennings and John J. Hillman Jul. 1977 8 p Submitted for publication
(NASA-TM-X-71367; X-693-77-164) Avail: NTIS HC A02/MF A01 CSCL 20K

A technique was developed for reducing the amplitude of the temperature oscillation in He closed-cyle refrigerators. The device uses a semiconductor diode as a heating element to actively supply a small oscillating input of heat at a point between the laser and the cold-tip to cancel the heat oscillations due to the refrigerator. It was found that the heater diode could drive the temperature of the heat sink more effectively, i.e., with lower current and therefore less heat, if the heat sink was insulated slightly from the rest of the mount. A sine-wave generator was used to drive the programmable supply which provided the offset current to the heater diode. By matching the frequency and phase of the oscillator to that of the refrigerator cycle, and by adjusting the amplitude of the oscillator signal, the temperature fluctuations at the laser could be minimized. Residual fluctuations were about 0.003K peak-to-peak, at an operating temperature of 9.5K. Author

N77-30273*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
PROCEEDINGS OF THE ASPE/MSFC SYMPOSIUM ON ENGINEERING AND PRODUCTIVITY GAINS FROM SPACE TECHNOLOGY
May 1977 279 p Conf. proc. held at Huntsville, Ala., 11-12 May 1977
(NASA-CP-2019) Avail: NTIS HC A13/MF A01 CSCL 05A

Aerospace technology findings were examined in regard to nonaerospace applications. Studies of energy generation, materials and processes, earth observation as well as advances and benefits of electronics are included. For individual titles, see N77-30274 through N77-30295.

N77-30274*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

ERDA/NASA-MSFC SOLAR HEATING AND COOLING DEVELOPMENT AND DEMONSTRATION PROGRAM c44
John M. Price *In its* Proc. of the ASPE/MSFC Symp. on Eng. and Productivity Gains from Space Technol. May 1977 p 9-17 (For primary document see N77-30273 21-31)
Avail: NTIS HC A13/MF A01 CSCL 10A

The role of the Manned Space Flight Center (MSFC) in the National Solar Heating and Cooling program is evaluated. The responsibilities of the MSFC within this program are (1) to manage the development and testing of solar heating and cooling systems leading to marketable products, (2) to develop data acquisition equipment supporting a national data program, and (3) to manage and collect data from commercial demonstration sites. MSFC test facilities and demonstration sites are described. J.H.

N77-30275*# Alabama Power Co., Birmingham.
IMPACT OF ALTERNATIVE ENERGY FORMS ON PUBLIC UTILITIES c44
F. W. Keith, Jr. *In* NASA. Marshall Space Flight Center Proc. of the ASPE/MSFC Symp. on Eng. and Productivity Gains from Space Technol. May 1977 p 19-31 (For primary document see N77-30273 21-31)
Avail: NTIS HC A13/MF A01 CSCL 10A

The investigation of alternative energy sources by the electric utility industry is discussed. Research projects are reviewed in each of the following areas; solar energy, wind energy conversion, photosynthesis of biomass, ocean thermal energy conversion, geothermal energy, fusion, and the environmental impact of alternative energy sources. J.H.

N77-30276*# General Electric Co., Philadelphia, Pa. Space Div.
WIND ENERGY: A RENEWABLE ENERGY OPTION c44
James S. Zimmerman *In* NASA. Marshall Space Flight Center Proc. of the ASPE/MSFC Symp. on Eng. and Productivity Gains from Space Technol. May 1977 p 33-68 (For primary document see N77-30273 21-31)
Avail: NTIS HC A13/MF A01 CSCL 10A

Wind turbine generator research programs administered by the Energy Research and Development Administration are examined. The design and operation of turbine demonstration models are described. Wind assessments were made to determine the feasibility of using wind generated power for various parts of the country. J.H.

N77-30277*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
RECENT DEVELOPMENTS IN PHOTOVOLTAIC ENERGY BY ERDA/NASA-LERC c44
James N. Deyo *In its* Proc. of the ASPE/MSFC Symp. on Eng. and Productivity Gains from Space Technol. May 1977 p 69-85 (For primary document see N77-30273 21-31)
Avail: NTIS HC A13/MF A01 CSCL 10A

Application development activities were designed to stimulate the market for photovoltaics so that as costs are reduced there will be an increasing market demand to encourage the expansion of industrial solar array production capacity. Supporting these application development activities are tasks concerned with: (1) establishing standards and methodology for terrestrial solar cell calibration; (2) conducting standard and diagnostic measurements on solar cells and modules; and (3) conducting real time and accelerated testing of solar cell modules and materials of construction under outdoor sunlight conditions. J.H.

N77-30278*# Energy Research and Development Administration, Washington, D.C. Ocean Systems Branch.
OCEAN THERMAL ENERGY CONVERSION (OTEC) c44
Abrahim Lavi *In* NASA. Marshall Space Flight Center Proc. of the ASPE/MSFC Symp. on Eng. and Productivity Gains from Space Technol. May 1977 p 87-94 (For primary document see N77-30273 21-31)
Avail: NTIS HC A13/MF A01 CSCL 10A

Energy Research and Development Administration research progress in Ocean Thermal Energy Conversion (OTEC) is outlined. The development program is being focused on cost effective heat exchangers; ammonia is generally used as the heat exchange fluid. Projected costs for energy production by OTEC vary between $1000 to $1700 per kW. J.H.

N77-30279*# Martin Marietta Corp., Denver, Colo.
ERDA'S CENTRAL RECEIVER SOLAR THERMAL POWER SYSTEM STUDIES c44
Lester J. Lippy and Thomas R. Heaton *In* NASA. Marshall Space Flight Center Proc. of the ASPE/MSFC Symp. on Eng. and Productivity Gains from Space Technol. May 1977 p 95-123 refs (For primary document see N77-30273 21-31)
Avail: NTIS HC A13/MF A01 CSCL 10A

The utilization of solar energy for electrical power production was studied. Efforts underway on the central receiver solar thermal power system are presented. Preliminary designs are included of pilot plant utilizing large numbers of heliostats in a collector field. Safety hazards are also discussed, as well as the most beneficial location of such a plant within the United States. B.L.P.

N77-30280*# IIT Research Inst., Chicago, Ill.
INDUSTRIAL BENEFITS AND FUTURE EXPECTATIONS IN MATERIALS AND PROCESSES RESULTING FROM SPACE TECHNOLOGY c85
John D. Meyer *In* NASA. Marshall Space Flight Center Proc. of the ASPE/MSFC Symp. and Productivity Gains from Space Technol. May 1977 p 129-135 (For primary document see N77-30273 21-31)
Avail: NTIS HC A13/MF A01 CSCL 05B

Space technology transfer is discussed as applied to the field of materials science. Advances made in processing include improved computer techniques, and structural analysis. Technology transfer is shown to have an important impact potential in the overall productivity of the United States. B.L.P.

N77-30281*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
EVALUATION AND CONTROL OF ENVIRONMENTAL CORROSION FOR ALUMINUM AND STEEL ALLOYS c26
D. B. Franklin *In its* Proc. of the ASPE/MSFC Symp. on Eng. and Productivity Gains from Space Technol. May 1977 p 137-147 (For primary document see N77-30273 21-31)
Avail: NTIS HC A13/MF A01 CSCL 11F

Corrosion protection systems for aerospace application and the effects of surface treatments and methods of controlling stress corrosion are evaluated. Chromate pigmented systems were found to be most effective for aluminum alloys; zinc-rich coatings gave the greatest protection to steel alloys. Various steel and aluminum alloys are rated for stress corrosion resistance. J.H.

N77-30282*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
POLYURETHANE ADHESIVE WITH IMPROVED HIGH TEMPERATURE PROPERTIES c27
James M. Stuckey *In its* Proc. of the ASPE/MSFC Symp. on Eng. and Productivity Gains from Space Technol. May 1977 p 149-152 (For primary document see N77-30273 21-31)
Avail: NTIS HC A13/MF A01 CSCL 11A

A polyurethane resin with paste activator, capable of providing useful bond strengths over the temperature range of -184 C to 149 C, is described. The adhesive system has a pot life of over one hour. Tensile shear strength ratings are given for various adhesive formulations. J.H.

N77-30283*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
POTENTIALLY IMPROVED GLASSES FROM SPACE ENVIRONMENT c27
Ronald Nichols *In its* Proc. of The ASPE/MSCF Symp. on Eng. and Productivity Gains from Space Technol. May 1977 p 153-157 (For primary document see N77-30273 21-31)
Avail: NTIS HC A13/MF A01 CSCL 11B

The benefits of processing glasses in a low-gravity space environment are examined. Containerless processing, the absence of gravity driven convection, and lack of sedimentation are seen as potential advantages. Potential applications include the formation of glass-ceramics with a high content of active elements for ferromagnetic devices, the production of ultrapure chalcogenide glasses for laser windows and IR fiber optics, and improved glass products for use in optical systems and laser fusion targets. J.H.

N77-30284*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
REAL TIME COMPUTER CONTROLLED WELD SKATE **c37**
William A. Wall *In its* Proc. of the ASPE/MSFC Symp. on Eng. and Productivity Gains from Space Technol. May 1977 p 159-164 (For primary document see N77-30273 21-31)
Avail: NTIS HC A13/MF A01 CSCL 13H

A real time, adaptive control, automatic welding system was developed. This system utilizes the general case geometrical relationships between a weldment and a weld skate to precisely maintain constant weld speed and torch angle along a contoured workplace. The system is compatible with the gas tungsten arc weld process or can be adapted to other weld processes. Heli-arc cutting and machine tool routing operations are possible applications. J.H.

N77-30285*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
FERROLUBRICANTS **c27**
Ann Whitaker *In its* Proc. of the ASPE/MSFC Symp. on Eng. and Productivity Gains from Space Technol. May 1977 p 165-169 (For primary document see N77-30273 21-31)
Avail: NTIS HC A13/MF A01 CSCL 11H

Properties of ferrolubricants and their potential uses are outlined in relation to industrial processes. Experiments with ball and journal bearings indicate significant advantages in the use of ferrolubricants. B.L.P.

N77-30286*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
PROCESSING ON HIGH EFFICIENCY SOLAR COLLECTOR COATINGS **c27**
Marion Roberts *In its* Proc. of the ASPE/MSFC Symp. on Eng. and Productivity Gains from Space Technol. May 1977 p 171-176 (For primary document see N77-30273 21-31)
Avail: NTIS HC A13/MF A01 CSCL 11D

Wavelength selective coatings for solar collectors are considered. Substrates with good infrared reflectivity were examined along with their susceptibility to physical and environmental damage. Improvements of reflective surfaces were accomplished through buffing, chemical polishing and other surface processing methods. B.L.P.

N77-30287*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
EXPERIMENTS ON ATMOSPHERIC PROCESSES **c46**
William W. Vaughan *In its* Proc. of the ASPE/MSFC Symp. on Eng. and Productivity Gains from Space Technol. May 1977 p 183-193 refs (For primary document see N77-30273 21-31)
Avail: NTIS HC A13/MF A01 CSCL 04A

Spacelab technology is examined as applied to the observation of the earth's weather patterns, composition, thermodynamics, and kinematics. An atmospheric cloud physics laboratory and a geophysical fluid flow cell are individually outlined as planned payload experiment efforts. B.L.P.

N77-30288*# National Aeronautics and Space Administration. Goddard Inst. for Space Studies, New York.
APPLICATIONS OF SPACE TECHNOLOGY TO WATER RESOURCES MANAGEMENT **c43**
V. V. Salomonson *In its* Poc. of the ASPE/MSFC Symp. on Eng. and Productivity Gains from Space Technol. May 1977 p 195-196 (For primary document see N77-30273 21-31)
Avail: NTIS HC A13/MF A01 CSCL 08H

Space technology transfer is discussed in terms of applying visible and infrared remote sensing measurement to water resources management. Mapping and monitoring of snowcovered areas, hydrologic land use, and surface water areas are discussed, using information acquired from LANDSAT and NOAA satellite systems. B.L.P.

N77-30289*# National Aeronautics and Space Administration. Goddard Inst. for Space Studies, New York.
SPACE TECHNOLOGY IN THE DISCOVERY AND DEVELOPMENT OF MINERAL AND ENERGY RESOURCES **c43**
Paul D. Lowman *In its* Proc. of the ASPE/MSFC Symp. on Eng. and Productivity Gains from Space Technol. May 1977 p 197-199 refs (For primary document see N77-30273 21-31)
Avail: NTIS HC A13/MF A01 CSCL 08G

Space technology, applied to the discovery and extraction of mineral and energy resources, is summarized. Orbital remote sensing for geological purposes has been widely applied through the use of LANDSAT satellites. These techniques also have been of value for protection against environmental hazards and for a better understanding of crustal structure. B.L.P.

N77-30290*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
DATA MANAGEMENT FOR EARTH OBSERVATIONS **c43**
George F. McDonough *In its* Proc. of the ASPE/MSFC Symp. on Eng. and Productivity Gains from Space Technol. May 1977 p 201-210 (For primary document see N77-30273 21-31)
Avail: NTIS HC A13/MF A01 CSCL 05B

The management of NASA earth observation data is discussed. User requirements are identified, as well as means to facilitate data acquisition. It is shown that LANDSAT data can be preprocessed to condense data into a more accessible format, thus reducing data acquisition costs. J.H.

N77-30291*# Texas A&M Univ., College Station.
X-RAY TOPOGRAPHY AS A PROCESS CONTROL TOOL IN SEMICONDUCTOR AND MICROCIRCUIT MANUFACTURE
D. L. Parker and W. A. Porter *In* NASA. Marshall Space Flight Center Proc. of the ASPE/MSFC Symp. on Eng. and Productivity Gains from Space Technol. May 1977 p 217-225 refs (For primary document see N77-30273 21-31)
Avail: NTIS HC A13/MF A01 CSCL 09C

A bent wafer camera, designed to identify crystal lattice defects in semiconductor materials, was investigated. The camera makes use of conventional X-ray topographs and an innovative slightly bent wafer which allows rays from the point source to strike all portions of the wafer simultaneously. In addition to being utilized in solving production process control problems, this camera design substantially reduces the cost per topograph. B.L.P.

N77-30292*# Sprague Electric Co., North Adams, Mass.
THE TANTALUM-CASED TANTALUM CAPACITOR **c33**
John D. Moynihan *In* NASA. Marshall Space Flight Center Proc. of the ASPE/MSFC Symp. on Eng. and Productivity Gains from Space Technol. May 1977 p 227-247 (For primary document see N77-30273 21-31)
Avail: NTIS HC A13/MF A01 CSCL 09A

Tantalum-cased tantalum capacitors were tested with regard to temperature stability, capacitance ratio, surge current capabilities, shock, vibration, and thermal shock. They were found to be superior to the conventional wet slug tantalum capacitor cased in silver, since they are more resistant to sulfuric acid. The tantalum-cased tantalum capacitors are widely accepted for use in critical electronic equipment because of their excellent performance and reliability. B.L.P.

N77-30293*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
USE OF HEAT PIPES IN ELECTRONIC HARDWARE **c33**
James R. Graves *In its* Proc. of the ASPE/MSFC Symp. on Eng. and Productivity Gains from Space Technol. May 1977 p 249-255 (For primary document see N77-30273 21-31)
Avail: NTIS HC A13/MF A01 CSCL 09C

A modular, multiple output power converter was developed in order to reduce costs of space hardware in future missions. The converter is of reduced size and weight, and utilizes advanced heat removal techniques, in the form of heat pipes which remove internally generated heat more effectively than conventional methods. B.L.P.

N77-30294*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
SPACE POWER TECHNOLOGY APPLIED TO THE ENERGY PROBLEM **c33**
J. L. Miller and J. R. Morgan *In its* Proc. of the ASPE/MSFC Symp. on Eng. and Productivity Gains from Space Technol. May 1977 p 257-269 refs (For primary document see N77-30273 21-31)

Avail: NTIS HC A13/MF A01 CSCL 10A

A solution to the energy problem is suggested through the technology of photovoltaic electrolysis of water to generate hydrogen. Efficient solar devices are discussed in relation to available solar energy, and photovoltaic energy cost. It is concluded that photovoltaic electrolytic generation of hydrogen will be economically feasible in 1985. B.L.P.

N77-30295*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

SEMICUSTOM INTEGRATED CIRCUITS AND THE STANDARD TRANSISTOR ARRAY RADIX (STAR) c33

Teddy M. Edge *In its* Proc. of the ASPE/MSFC Symp. on Eng. and Productivity Gains from Space Technol. May 1977 p 271-289 (For primary document see N77-30273 21-31)

Avail: NTIS HC A13/MF A01 CSCL 09C

The development, application, pros and cons of the semicustom and custom approach to the integration of circuits are described. Improvements in terms of cost, reliability, secrecy, power, and size reduction are examined. Also presented is the standard transistor array radix, a semicustom approach to digital integrated circuits that offers the advantages of both custom and semicustom approaches to integration. B.L.P.

N77-30296*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

TRANSFER OF MOLYBDENUM DISULFIDE TO VARIOUS METALS

Gilbert C. Barton (Weber State College, Ogden, Utah) and Stephen V. Pepper Aug. 1977 17 p refs

(NASA-TP-1019; E-8965) Avail: NTIS HC A02/MF A01 CSCL 07D

Sliding friction experiments were conducted with molybdenum disulfide single crystals in contact with sputter cleaned surfaces of copper, nickel, gold, and 304 stainless steel. Transfer of the molybdenum disulfide to the metals was monitored with Auger electron spectroscopy. Results of the investigation indicate molybdenum disulfide transfers to all clean metal surfaces after a single pass over the metal surface with film thickness observed to increase with repeated passes over the same surfaces. Large particle transfer occurs when the orientation of the crystallites is other than basal. This is frequently accompanied by abrasion of the metal. Adhesion of molybdenum disulfide films occurred readily to copper and nickel, less readily to 304 stainless steel, and even less effectively to the gold, which indicates a chemical effect. Author

N77-30297# Naval Ship Research and Development Center, Bethesda, Md. Ship Performance Dept.

A SYNTHESIS OF AALC PROGRAM AIR CUSHION VEHICLE SEAKEEPING DATA

Alvin Gersten Apr. 1977 79 p refs

(AD-A040122; SPD-765-01) Avail: NTIS HC A05/MF A01 CSCL 13/10

Seakeeping data for air cushion supported landing craft have been produced during investigations sponsored either directly or indirectly by the Amphibious Assault Landing Craft Program Office. These data have been brought together in this report so that comparisons can be made between the Aerojet General Corporation and Bell Aerospace Company designs. Drag in waves is provided as well as motions from random wave experiments and experiments conducted in surf. Among the data presentations, response amplitude operators and significant motions and accelerations can be found. Various configurations -- from the early C150-50's to the current JEFF boats -- have been considered. Author (GRA)

N77-30298# National Physical Lab., Teddington (England). Div. of Mechanical and Optical Metrology.

A METHOD FOR COMPUTING THE EFFECTIVE AREA OF A PRESSURE BALANCE FROM DIAMETRAL MEASUREMENTS

G. N. Peggs Mar. 1977 33 p refs

(NPL-MOM-23) Avail: NTIS HC A03/MF A01

The determination of the effective area of a pressure balance from diametral measurements is a most important aspect of the use of this type of device as a pressure standard. A computer program (written in Algol 60) is described that enables effective areas to be determined for piston-cylinder combinations which use either a compressible or a non-compressible fluid. To illustrate the program's application an example is taken from practice. Author (ESA)

N77-30299# Naval Postgraduate School, Monterey, Calif.

LIFT AND DRAG MEASUREMENT AND ANALYSIS OF THE STERN SEAL OF THE CAPTURED AIR BUBBLE TESTCRAFT XR-3 M.S. Thesis

James Armand Boland Mar. 1977 116 p refs

(AD-A039149) Avail: NTIS HC A06/MF A01 CSCL 13/10

Tests were run to measure the total lift and drag forces acting on the stern seal of the surface effect ship testcraft XR-3. Stern seal lift and drag as well as total testcraft drag were plotted against testcraft speed as a function of craft weight, speed, center of gravity and rear seal overpressure. Author (GRA)

N77-30300# Naval Postgraduate School, Monterey, Calif.

POWER OPTIMIZATION OF THE CAPTURED AIR BUBBLE SURFACE EFFECTS SHIP M.S. Thesis

Frederick Kenneth Richardson Dec. 1976 111 p refs

(AD-A039341) Avail: NTIS HC A06/MF A01 CSCL 13/10

Through the use of simulation studies of the Surface Effects Ship (SES) XR-3, it is shown that power optimization can be achieved by controlling the air bubble plenum pressure and the pitch angle of the craft. Studies indicate a savings of up to forty percent in total power required for cruising speeds in the range of fifteen to thirty knots. Author (GRA)

N77-30301# Naval Ship Research and Development Center, Bethesda, Md. Aviation and Surface Effects Dept.

PERFORMANCE PREDICTION METHOD FOR A WING-IN-GROUND EFFECT VEHICLE WITH BLOWING UNDER THE WING Final Report, Sep. 1976 - Mar. 1977

David G. Rousseau and Roger W. Gallington Mar. 1977 37 p refs

(AD-A039829; DTNSRDC/ASED-379) Avail: NTIS HC A03/MF A01 CSCL 01/3

Recent efforts in theoretical analysis and experimental observations have moved the concept of power-augmented flight in ground effect toward practicality. With the addition of lift and drag due to external airflow, end-plate leakage, water skin friction, wave drag effects, and wave clearance constraints, a flow model can be made capable of effective comments. The analysis shows that there are wave drag and wave clearance related limits to many aspects of the vehicle configuration. The most important of which are cruising height and aspect ratio, in that they have a very large effect on transport efficiency. Unfortunately, the low flying high aspect ratio cases are ruled out due to wave impact problems. Testing of a point design vehicle, arrived at through the use of analysis such as the one of this report, needs to be performed as final verification of the accuracy of the design procedure. Author (GRA)

N77-30302# Chi Associates, Washington, D. C.

EXECUTIVE AND TABULAR SUMMARY OF AIR BAG FIELD EXPERIENCE. VOLUME 1, NO. 1 Final Report, Oct. 1972 - Aug. 1976

Lotta Chi and Ann Dalsimer Apr. 1977 173 p Sponsored by DOT

(PB-266933/1; DOT-HS-802301) Avail: NTIS HC A08/MF A01 CSCL 13F

Narrative summaries and tables which describe a total of 119 accidents occurring during the past 4 years involving air bag equipped cars are presented. The information was extracted from the NHTSA in-depth reports by accident investigation teams from five regional research stations. In each case, the following data are included: data, location, DOT HS number, type of impact, year and make of air bag equipped vehicle, type of accident, year and make of other vehicle(s) involved, speed of impact, driver and passenger(s) information, their injury code, damage to the vehicle, and damage code. GRA

N77-30303# National Bureau of Standards, Boulder, Colo. Cryogenics Div.

LIQUID HELIUM STORAGE AT HIGH DENSITY AND DISCHARGE AT HIGH FLOW RATES Final Report

David E. Daney Dec. 1976 55 p refs Sponsored in part by AFWL
(PB-266945/5; NBSIR-76-850) Avail: NTIS HC A04/MF A01 CSCL 13D

Equipment to store supercritical helium at high density and to demonstrate pulsed discharge at high flow rates was designed, fabricated, and successfully tested. A storage density of 193 kg/cu m (12.03 lb/cu ft) at 8.3 MPa (81 atm) was achieved in a 135 liter (35 gal) dewar. Pulsed discharges of 2 seconds and 4 seconds duration were demonstrated at a flow rate of 1.0 kg/s (2.2 lb/s), and flow fluctuations of less than + or - 1 percent were achieved without feedback control. In general, the system operated in a very stable and well behaved manner.

GRA

32 COMMUNICATIONS

Includes land and global communications; communications theory; and optical communications.

For related information see also *04 Aircraft Communications and Navigation* and *17 Spacecraft Communications, Command and Tracking*.

N77-30304 Illinois Univ., Urbana-Champaign.
THE URBANA METEOR-RADAR SYSTEM: DESIGN, DEVELOPMENT, AND FIRST OBSERVATIONS Ph.D. Thesis
Garry Carson Hess 1976 354 p
Avail: Univ. Microfilms Order No. 77-9027

The design, development, and first observations of a highpower meteor-radar system located near Urbana, Illinois are described. The roughly five-fold increase in usable echo rate compared to other facilities, along with automated digital data processing and interferometry measurement of echo arrival angles, permits unsurpassed observations of tidal structure and shorter period waves. Such observations are discussed at length. Also, the technique of using echo decay rates to infer density and scale height and the technique of inferring wind shear from radial acceleration are examined. Lastly, an original experiment to test a theory of the D-region winter anomaly is presented.

Dissert. Abstr.

N77-30305 Illinois Univ., Urbana-Champaign.
UNIFORM ASYMPTOTIC THEORY APPLIED TO APERTURE DIFFRACTION Ph.D. Thesis
Ronald Charles Menendez 1976 139 p
Avail: Univ. Microfilms Order No. 77-9097

Diffraction by a slit illuminated by a line source was studied to derive simple and explicit rules for the role and validity of the geometrical theory of diffraction in a general aperture problem. An asymptotic solution is provided for high frequency electromagnetic field transmission from a variety of aperature antennas using the uniform asymptotic theory. Dissert. Abstr.

N77-30306 Cornell Univ., Ithaca, N.Y.
DESIGN OF GENERALIZED WAVED DIGITAL AND ACTIVE FILTER STRUCTURES Ph.D. Thesis
Siu-Ming Ing 1976 144 p
Avail: Univ. Microfilms Order No. 77-8369

The feasibility of designing GWDF's based on commensurate transmission line (UE) prototypes is illustrated by choosing an analog prototype made up of a cascade of UE's, driven from a resistive source and terminated on a resistor. General and explicit equations are derived, and scaling techniques for roundoff noise reduction in the digital structure are presented. The design of a GWDF based on a lumped element prototype is illustrated by using the Foster Form realization of a LC driving point impedance as the prototype. An active filter building block, which simulates the scattering matrix of UE's is introduced and used in the realization of a WAF based on UE prototypes. Dissert. Abstr.

N77-30307 Illinois Univ., Urbana-Champaign.
THE SINGULARITY EXPANSION REPRESENTATION OF THE TRANSIENT ELECTROMAGNETIC COUPLING THROUGH A REACTANGULAR APERTURE Ph.D. Thesis
Lonnie Wilson Pearson 1976 119 p
Avail: Univ. Microfilms Order No. 77-9141

The problem of electromagnetic coupling through a rectangular aperture is approached by determining the singularity expansion quantities for the electromagnetic structure of the rectangular plate. The pole trajectories for the plate are given for a range of aspect ratios, along with natural modes at specimen poles. Physical and numerical interpretations for these data are stated where possible. Theoretical aspects of SEM relating to coupling coefficient forms and to the role of complex domain entire functions in the time domain SEM representation are explored. Correct coupling coefficient forms are found to depend on the asymptotic behavior at infinity of the frequency domain Green's function. Dissert. Abstr.

N77-30308* National Aeronautics and Space Administration. Goddard Inst. for Space Studies, New York.
PSEUDO NOISE CODE AND DATA TRANSMISSION METHOD AND APPARATUS Patent
Leonard F. Deerkoski, inventor (to NASA) Issued 9 Aug. 1977 12 p Filed 30 Dec. 1975 Supersedes N76-16302 (14 - 07, p 0833)
(NASA-Case-GSC-12017-1; US-Patent-4,041,391; US-Patent-Appl-SN-645510; US-Patent-Class-325-30; US-Patent-Class-325-42; US-Patent-Class-325-65; US-Patent-Class-325-473) Avail: US Patent Office CSCL 17B

Pseudo noise ranging codes, having a predetermined chipping rate, and a pair of binary data sources, each having a bit rate no greater than one tenth the chipping rate, quadriphase, digitally modulate a suppressed carrier wave having a first frequency are examined. Two additional binary data sources, each having a bit rate that is not restricted by the chipping rate of the first carrier, quadriphase, digitally modulate a suppressed carrier wave having a second frequency. The first and second frequencies are only slightly displaced so that there is overlap in the frequency bands which modulate the two carriers. The two suppressed carrier waves are linearly combined and transmitted from a first station to a second station so that the amplitude of the transmitted first wave is controlled so as not to degrade the detectability of the second wave at the second station.

Official Gazette of the U.S. Patent Office

N77-30309* National Aeronautics and Space Administration. Goddard Inst. for Space Studies, New York.
SPEECH ANALYZER Patent
Donald C. Lokerson, inventor (to NASA) Issued 2 Aug. 1977 9 p Filed 9 Apr. 1975 Supersedes N75-22563 (13 - 14, p 1637)
(NASA-Case-GSC-11898-1; US-Patent-4,039,754; US-Patent-Appl-SN-566494; US-Patent-Class-179-1SA; US-Patent-Class-179-1SP) Avail: US Patent Office CSCL 17B

A speech signal is analyzed by applying the signal to formant filters which derive first, second and third signals respectively representing the frequency of the speech waveform in the first, second and third formants. A first pulse train having approximately a pulse rate representing the average frequency of the first formant is derived; second and third pulse trains having pulse rates respectively representing zero crossings of the second and third formants are derived. The first formant pulse train is derived by establishing N signal level bands, where N is an integer at least equal to two. Adjacent ones of the signal bands have common boundaries, each of which is a predetermined percentage of the peak level of a complete cycle of the speech waveform.

Official Gazette of the U.S. Patent Office

N77-30310 Southern Methodist Univ., Dallas, Tex.
DIGITAL FILTERS AND SIGNAL PROCESSING OF FREQUENCY SHIFT KEYED SIGNALS BY AUTOREGRESSIVE SPECTRAL ANALYSIS Ph.D. Thesis
Ravindra Billa 1976 122 p
Avail: Univ. Microfilms Order No. 77-9787

The research described is concerned with the spectral analysis and digital reception of the general code-selected frequency shift keyed signal problem. The signal consists of a single frequency and is viewed as having a time-varying spectrum. This includes frequency hopped signals. The signal is received in an additive channel. The problem is treated essentially as a frequency

identification problem. The work is conveniently divided into two parts. The first part deals with the study of a suitable digital bandpass filter. This filter is used for the specific purpose of signal-to-noise ratio improvement in the receiver structure proposed in the second part. For this bandpass application, the wave digital filter is adopted and its sensitivity properties are established in comparison with the corresponding direct form implementation. In the second part attention is devoted to the receiver structure. The idea of employing autoregressive spectral estimation is introduced. Dissert. Abstr.

N77-30311 Ohio State Univ., Columbus.
SMALL APERTURE ADAPTIVE ANTENNA ARRAYS Ph.D. Thesis
Mark Joseph VanDeWalle 1976 179 p
Avail: Univ. Microfilms Order No. 77-10617

An antenna array of L elements and a signal source are modeled as an L+1 terminal network such that a set of element voltages are developed that include the mutual coupling terms. This model of the array and source is used to generate a set of input signals to an adaptive processor utilizing the Least Mean Square (LMS) algorithm. The effect of mutual coupling and aperture size on the steady state adaptive array performance for one desired signal and up to eighteen interfering signals is presented. The desired and undesired signals are assumed to be uncorrelated and narrow band. It is shown that the mutual impedance terms are not explicitly present in the expression for the total power received at the array output. Calculations are presented showing the effect of mutual coupling on the element voltages and element weights. Dissert. Abstr.

N77-30312 Northwestern Univ., Evanston, Ill.
THE INTERACTION OF MICROWAVES AND MICROWAVE SOUND WITH THE PARAELECTRIC SYSTEM KCl:OH(-) Ph.D. Thesis
Sherwin Robert Kahn 1976 158 p
Avail: Univ. Microfilms Order No. 77-10043

Paraelectric resonance experiments were performed at K-band on annealed and unannealed commercially grown KCl crystals. From the annealed behavior, it was concluded that the two resonance lines observed at high electric fields are due to OH(-) dipolar impurities normally present in such material with a concentration of one part per million. The low field line often attributed to OH(-) is found to be more complex. It was concluded that the line is influenced by an impurity in addition to OH(-). An experiment was designed to investigate the interaction of microwave sound with material. The strong coupling to the crystal lattice of the electric and elastic dipole moments of the OH(-) impurity permits phonons to interact with the system. The absorption of 8.7 GHz transverse acoustic phonons generated by a quartz transducer was observed. Dissert. Abstr.

N77-30313*# McDonnell-Douglas Technical Services Co., Inc., Houston, Tex.
LIMITATIONS ON Ku-BAND COMMUNICATIONS DUE TO MULTIPATH
J. F. Lindsey and J. F. Rudnicki Aug. 1977 110 p refs
(Contract NAS9-14960)
(NASA-CR-151490; DN-1,2-DN-B0703-008) Avail: NTIS HC A06/MF A01 CSCL 17B

The earth and orbiter body reflections involving the Tracking Data Relay Satellite (TDRS)/orbiter communications link are evaluated. Recommendations address operational conditions in order to avoid critical multipath impacts, modulation preferences during acquisition, and preferred scan limit implementation. Author

N77-30314*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
STATISTICS OF THE RADIATED FIELD OF A SPACE-TO-EARTH MICROWAVE POWER TRANSFER SYSTEM
Grady H. Stevens and Gary Leininger (Toledo Univ., Ohio) [1976] 39 p refs
(NASA-TM-X-73684; E-9217) Avail: NTIS HC A02/MF A01 CSCL 20N

Statistics such as average power density pattern, variance of the power density pattern and variance of the beam pointing error are related to hardware parameters such as transmitter rms phase error and rms amplitude error. Also a limitation on spectral width of the phase reference for phase control was established. A 1 km diameter transmitter appears feasible provided the total rms insertion phase errors of the phase control modules does not exceed 10 deg, amplitude errors do not exceed 10% rms, and the phase reference spectral width does not exceed approximately 3 kHz. With these conditions the expected radiation pattern is virtually the same as the error free pattern, and the rms beam pointing error would be insignificant (approximately 10 meters). Author

N77-30315*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
MUTUAL ADMITTANCE BETWEEN CIRCULAR WAVE-GUIDE-FED APERTURES FOR LARGE SPACING
M. C. Bailey Jul. 1977 17 p refs
(NASA-TM-74054) Avail: NTIS HC A02/MF A01 CSCL 20N

A closed-form asymptotic expression for the mutual admittance between two circular waveguide-fed apertures is developed for large element spacings. A comparison with calculations obtained by a numerical integration method indicated that the present analysis gives good results for spacings greater than two wavelengths. Author

N77-30316*# Axiomatix, Marina del Rey, Calif.
STUDY TO INVESTIGATE AND EVALUATE MEANS OF OPTIMIZING THE Ku-BAND COMBINED RADAR/COMMUNICATION FUNCTIONS FOR THE SPACE SHUTTLE
Charles L. Weber, Sergei Udalov, and Waddah Alem 31 May 1977 219 p refs
(Contract NAS9-14614)
(NASA-CR-151497; R7705-1; Rept-1) Avail: NTIS HC A10/MF A01 CSCL 17B

The performance of the space shuttle orbiter's Ku-Band integrated radar and communications equipment is analyzed for the radar mode of operation. The block diagram of the rendezvous radar subsystem is described. Power budgets for passive target detection are calculated, based on the estimated values of system losses. Requirements for processing of radar signals in the search and track modes are examined. Time multiplexed, single-channel, angle tracking of passive scintillating targets is analyzed. Radar performance in the presence of main lobe ground clutter is considered and candidate techniques for clutter suppression are discussed. Principal system parameter drivers are examined for the case of stationkeeping at ranges comparable to target dimension. Candidate ranging waveforms for short range operation are analyzed and compared. The logarithmic error discriminant utilized for range, range rate and angle tracking is formulated and applied to the quantitative analysis of radar subsystem tracking loops. Author

N77-30317*# National Aeronautics and Space Administration. Goddard Inst. for Space Studies, New York.
THE 13.9 GHz SHORT PULSE RADAR NOISE FIGURE MEASUREMENTS UTILIZING SILICON AND GALLIUM-ARSENIDE MIXER DIODES
Mark Dombrowski Jul. 1977 15 p refs
(NASA-TM-X-71362; X-953-77-147) Avail: NTIS HC A02/MF A01 CSCL 17I

An analysis was made on two commercially available silicon and gallium arsenide Schottky barrier diodes. These diodes were selected because of their particularly low noise figure in the frequency range of interest. The specified noise figure for the silicon and gallium arsenide diodes were 6.3 db and 5.3 db respectively when functioning as mixers in the 13.6 GHz region with optimum local oscillator drive. Author

N77-30318*# Gold (Robert) Associates, Los Angeles, Calif.
TDRSS TELECOMMUNICATION SYSTEM PN CODE ANALYSIS Final Report
Robert Gold 1 Apr. 1977 90 p ref
(Contract NAS5-22546)
(NASA-CR-152580) Avail: NTIS HC A05/MF A01 CSCL 17B

The pseudonoise (PN) code library for the Tracking and Data Relay Satellite System (TDRSS) Services was defined and described. The code library was chosen to minimize user

transponder hardware requirements and optimize system performance. Special precautions were taken to insure sufficient code phase separation to minimize cross-correlation sidelobes, and to avoid the generation of spurious code components which would interfere with system performance. Author

N77-30319# Sperry Rand Research Center, Sudbury, Mass.
MULTIPLE FREQUENCY CLASSIFICATION TECHNIQUE Final Technical Report, 26 Nov. 1975 - 30 Nov. 1976
J. P. Toomey and C. L. Bennett Mar. 1977 84 p refs
(Contract F30602-76-C-0039)
(AD-A039497; RADC-TR-77-120) Avail: NTIS HC A05/MF A01 CSCL 17/9

The overall objective of this study was to develop a method for the shape classification of space objects using data from two or more collocated radars operating at different frequencies. The basic technique consists of appropriately comparing the received radar data with the contents of a stored signature library which is obtained with the Space-Time Integral Equation (STIE) method for calculating the exact impulse response (or entire frequency response) of conducting bodies. GRA

N77-30320# RAND Corp., Santa Monica, Calif.
A NEW APPROACH TO MILLIMETER-WAVE COMMUNICATIONS Interim Report
N. E. Feldman and S. J. Dudzinsky Apr. 1977 28 p refs
(AD-A039485; R-1936-RC) Avail: NTIS HC A03/MF A01 CSCL 17/2

An argument for the use of the millimeter wave band for military earth-satellite communications systems is given. Important advantages accruing from this use are larger bandwidths and narrower antenna beamwidths, which would reduce interference and ameliorate the frequency management problem while also improving covertness and resistance to jamming. However, millimeter waves are particularly susceptible to attenuation by rainfall. A new approach for designing around the rainfall problem is described and its benefits discussed. Outages caused by rainfall can be avoided by a variety of automatic switching schemes, by using techniques for increasing jam resistance, or by switching to a satellite in a different direction. The concept proposes switching only high-precedence traffic and only for the duration of the outage at the ground terminal. Author (GRA)

N77-30321# Clarkson Coll. of Technology, Potsdam, N.Y.
NETWORK TIMING/SYNCHRONIZATION EVALUATION MODELING
David A. Perreault, Rangaswamy Mukunday, Komandur R. Krishman, and Robert F. Cotellessa Apr. 1977 81 p refs
(Contract F30602-75-C-0082)
(AD-A039378; RADC-TR-77-19) Avail: NTIS HC A05/MF A01 CSCL 17/2

Digital transmission techniques are expected to play an important role in future Defense Communication Systems, since they offer many advantages over analog methods. One of the important requirements for digital transmission is synchronization of nodal clocks. This report evaluates four proposed synchronization techniques (Discrete-Control-Correction, Master Slave, Independent Clocks, and Time Reference Distribution) with respect to a set of overall system objectives. It is found that of the proposed techniques, the time reference distribution technique with further refinements will best meet the DCS requirements. Author (GRA)

N77-30322# Cincinnati Electronics Corp., Ohio.
RADIO SET AN/PRC-70 ( ) Final Report
C. A. Bucher Feb. 1977 143 p refs
(Contract DAAB07-71-C-0319)
(AD-A039461; Rept-80045-PRC-42/676; ECOM-71-0319-9) Avail: NTIS MF A01 CSCL 17/2

This final report on the development of the Radio Set AN/PRC-70 manpack receiver-transmitter is concerned with the technical aspects and problems encountered in the development and test of the 21 (ET/ST) Engineering Test/Service Test Models. Author (GRA)

N77-30323# Army Communications Command, Fort Huachuca, Ariz.
PRODUCT ASSURANCE, OPERATIONAL QUALITY ASSURANCE, RADIO SYSTEMS EVALUATION
31 Mar. 1977 108 p
(AD-A039487; ACC-CCP-702-8) Avail: NTIS HC A06/MF A01 CSCL 17/2

This document provides a guide for testing, evaluating, and characterizing the transmission quality and functional capability of the post, camp, and station, single channel frequency modulated radio networks and high frequency amplitude modulated and single sideband systems. Author (GRA)

N77-30324# Army Test and Evaluation Command, Aberdeen Proving Ground, Md.
ELECTROMAGNETIC RADIATION EFFECTS AND/OR HAZARDS TEST Final Report
18 Mar. 1976 16 p Revised
(AD-A039703; TOP-1-2-511) Avail: NTIS HC A02/MF A01 CSCL 09/3

Provides methods for instrumenting and testing Army Materiel to determine the effect of an electromagnetic environment on the operation and/or safety of the materiel. Author (GRA)

N77-30325# Delaware Univ., Newark. Dept. of Mathematics.
ELECTROMAGNETIC SCATTERING BY PERFECTLY CONDUCTING OPEN SURFACES
John S. Asvestas Mar. 1977 113 p refs
(Grant AF-AFOSR-2634-74)
(AD-A039569; AFOSR-77-0626TR; Rept-2634-4) Avail: NTIS HC A06/MF A01 CSCL 20/3

The behavior of simple layer potentials and their spatial derivatives near the edge of an open surface is analyzed. Conditions are determined on the surface geometry and on the density distributions for which the potentials have locally finite energy. These results are applied to the formulation problems of electromagnetic scattering from open surface as integral equations. It is shown that for certain classes of open surfaces and current densities, the boundary value problem is equivalent to a problem in integral equations of the first kind which can have at most one solution. Author (GRA)

N77-30326# IIT Research Inst., Chicago, Ill.
A MODEL TO PREDICT MUTUAL INTERFERENCE EFFECTS ON AN AIRFRAME Final Report
Priscilla A. Dwyer Oct. 1976 161 p refs
(Contracts F19628-76-C-0017; DOT-FA70WAI-175)
(AD-A039224; ECAC-PR-76-067; FAA-RD-76-50) Avail: NTIS HC A08/MF A01 CSCL 09/3

Sponsored by the FAA, the Electromagnetic Compatibility Analysis Center has developed an analysis model, called AVPAK, to determine the mutual interference effects of introducing new avionics equipment to an existing air frame containing operational equipment. The model has been updated, improved, and expanded in a series of scheduled efforts. In this report, those improvements have been summarized and the current version of the model (AVPAK 3) is completely documented. Author (GRA)

N77-30327# Lincoln Lab., Mass. Inst. of Tech., Lexington.
AN ECL GATE ARRAY REALIZATION OF A COMPUTER FOR REAL TIME SPEECH SYNTHESIS
Robert Berger 7 Mar. 1977 44 p refs
(Contract F19628-76-C-0002; AF Proj. 649L)
(AD-A039179; TN-1977-11; ESD-TR-77-58) Avail: NTIS HC A03/MF A01 CSCL 17/2

This note describes the Lincoln Integrated Speech Synthesizer (LISSYN), a general-purpose computer intended for speech processing, whose central processor is made from ECL gate arrays (large scale integrated circuits custom built at Lincoln Laboratory). The goal was to use gate arrays to implement in real time the synthesis portion of a linear predictive vocoder operating at 4800 bits/sec. The design process stressed minimizing the number of different kinds of gate arrays and the number of non-gate-array circuit packages. The result is a general purpose computer structure featuring: single 1024 x 16 memory for data and program, 200 nsec instruction cycle, 950 nsec add/shift multiply, binary serial input, analog output via a 12-bit D/A converter and desampling filter, 0.35 cu. ft. volume, 60 watts dc power, 11 gate arrays of 5 types, 30 memory IC's, 27 other circuit packages. The LISSYN runs the linear predictive speech synthesis in 43% of real time. Author (GRA)

N77-30328# Sperry Rand Research Center, Sudbury, Mass.
SURFACE WAVE MULTIPLEXING TECHNIQUES Final Report, 10 Sep. 1975 - 10 Dec. 1976
Leland P. Solie Apr. 1977 76 p refs
(Contract DAAB07-76-C-1284; DA Proj. 1L7-62705)
(AD-A039390; SCRC-CR-76-1; ECOM-76-1284-F) Avail: NTIS HC A05/MF A01 CSCL 20/14

Two multiplexers using offset multistrip couplers (MSC) are described. One is an 8-channel device with 10 MHz bandwidth in each channel. The other is a 16-channel device with 4 MHz contiguous (overlapping at the 3 db levels) channels. The total insertion loss per channel for these devices is around 17 db. The out of band rejection ranges from 30 to 45 db. The frequency sorting is accomplished by a set of offset MSC's which channel the surface wave into various tracks according to frequency. Narrow-band output transducers using a specially developed 'staggered tap' geometry provide most of the selectivity. Author (GRA)

N77-30329# Tetra Tech, Inc., Pasadena, Calif.
PARAMETER STUDY OF REFLECTION REDUCTION BY IMPEDANCE GRIDS Final Report
R. W. Latham Kirtland AFB, N. Mex. AFWL Sep. 1975 56 p refs
(Contract F29601-72-C-0089)
(AD-A039656; AFWL-TR-74-69) Avail: NTIS HC A04/MF A01 CSCL 20/14

Electromagnetic reflection from the walls of the vacuum chamber of a satellite simulator may be reduced by placing one or more grids of wires having known impedances just inside the conducting wall. This report presents the results of a parameter study on the effect of wire spacing and wire resistance and inductance on the frequency dependence of the reflection coefficient of a wall with such a grid in front of it. This data should be useful in helping to choose good values of the design parameters of reflection reducing grids in satellite simulators. Author (GRA)

N77-30330# Illinois Univ., Chicago. Communications Lab.
A NOVEL FORMULATION OF RADIATION FROM OPEN-ENDED GUIDING STRUCTURES
Giorgio Franceschetti Mar. 1977 47 p refs
(Grant AF-AFOSR-3253-77; AF Proj. 2304)
(AD-A039570; CL-77-1; AFOSR-77-0641TR) Avail: NTIS HC A03/MF A01 CSCL 20/14

A new formulation for radiation from open-ended guiding structures is developed and applied to open-ended transmission lines, coaxial cables, parallel-plate and circular waveguides. The theory is also extended to flared radiators. Author (GRA)

N77-30331# Syracuse Univ., N. Y.
ANTENNA PATTERN SYNTHESIS COMPUTER PROGRAM
Jose Perini and Kazuhiro Hirasawa Feb. 1977 21 p refs
(Contract F30602-75-C-0121; AF Proj. 9567)
(AD-A039188; RADC-TR-77-37) Avail: NTIS HC A02/MF A01 CSCL 20/14

Optimization techniques have been applied to the antenna pattern synthesis problem using point sources and ignoring the mutual coupling effects. If these effects are to be taken into account, it becomes very costly to perform the synthesis. In this report an approximate way to solve this problem has been prepared and implemented on a computer program. Author (GRA)

N77-30332# Naval Research Lab., Washington, D. C.
TE-MODE SOLUTIONS FOR DIELECTRIC SLAB CENTER LOADED RIDGED WAVEGUIDE Interim Report
Charles W. Young, Jr. 29 Apr. 1977 19 p refs
(AD-A039965; NRL-8105) Avail: NTIS HC A02/MF A01 CSCL 09/1

Dielectric slab center loaded ridged waveguide has been analyzed to obtain TE sub 10 propagation characteristics for the losses case. The analysis was performed by solving for the lowest order resonance of the transverse wave component, using an equivalent transmission line circuit which models the height change at the ridge as an effective shunt susceptance. Calculated and measured data are compared; they show good agreement. The analysis should prove useful in designing transformers to match empty ridged waveguide to slab loaded rectangular waveguide components such as toroidal phase shifters. Author (GRA)

N77-30333# Systems Science and Software, La Jolla, Calif.
HYBRID EM METHODS Final Report
Ira Katz, Donald E. Parks, Andrew Wilson, James M. Harvey, and Manuel Rotenberg Kirtland AFB, N. Mex. AFWL May 1977 79 p refs
(Contract F29601-76-C-0025)
(AD-A039771; SSS-R-76-2976; AFWL-TR-76-266) Avail: NTIS HC A05/MF A01 CSCL 09/3

This report summarizes a study of hybrid electrostatic-electromagnetic techniques for the calculation of SGEMP generated surface currents. Presented are results using the hybrid SQUID code, a technique to treat the currents in small struts, and a theory of nonreflective coundary conditions for electromagnetic SGEMP codes. Author (GRA)

N77-30334# Illinois Univ., Urbana-Champaign. Electromagnetics Lab.
TECHNIQUES FOR EXTRACTING THE COMPLEX RESONANCES OF A SYSTEM DIRECTLY FROM ITS TRANSIENT RESPONSE Final Report
M. L. VanBlaricum and R. Mittra Kirtland AFB, N. Mex. AFWL Apr. 1977 152 p refs
(Grant AF-AFOSR-2861-75)
(AD-A039881; AFWL-TR-76-250) Avail: NTIS HC A08/MF A01 CSCL 09/4

An approach for extracting the singularities of a system from its transient response to a given excitation is discussed. The method developed is based on Prony's algorithm. Some basic problems which are associated with the use of Prony's algorithm are discussed and solutions are obtained. The singularities thus identified are useful in the singularity expansion method (SEM) of describing system response. It is demonstrated that Prony's method is applicable to systems with multiple as well as simple pole singularities. Two techniques are presented for systematically determining the number of poles contained in a transient response. Several numerical examples are presented to demonstrate these capabilities. The dependence of Prony's method on the noise level in the transient response is considered in detail and the results of several statistical tests are presented. The Pade approximation is suggested as an alternative to Prony's method but is demonstrated to be unsatisfactory. Author (GRA)

N77-30335# Electronic Communications, Inc., Santa Barbara, Calif.
ANALOG BUILDING BLOCKS FOR COMMUNICATIONS MODEMS Final Report, 1 Jun. 1974 - 31 Dec. 1975
Bruce Black Jan. 1977 274 p
(Contract F33615-74-C-1120; AF Proj. 1227)
(AD-A039825; AFAL-TR-76-29) Avail: NTIS HC A12/MF A01 CSCL 09/5

Three sets of modern building block modules were designed, fabricated and delivered to the Air Force. Each module was identified as a basic functional unit in a majority of modern applications. In addition a Costas demodulator paper design was presented for further evaluation and possible future hardware implementation. Modules delivered included a set of five 70 MHz amplifiers, each with specified gain and bandwidth, a phase-lock frequency multiplier at 4 MHz, and a frequency agile synthesizer with output center frequency in the lower VHF radio spectrum. Included in the study are discussions of the general requirements for each of the four modules as well as test and evaluation of the delivered units. Author (GRA)

N77-30336# Electronics Engineering Group (1842nd), Richards-Gebaur AFB, Mo.
DESIGN SPECIFICATION FOR AFCS UNIVERSAL PERFORMANCE ASSESSMENT AND CONTROL SYSTEM Final Report
David R. Wortendyke and Richard J. Steele 17 Mar. 1977 39 p refs
(AD-A040926; EEG/EEIMM-TR-77-17) Avail: NTIS HC A03/MF A01 CSCL 09/2

A prototype data acquisition system that utilizes commercial software and hardware design concepts, for use in the develop-

ment of performance monitoring systems of communication networks, has been designed, assembled, and checked out for the use of the USAF/AFCS. This document provides the design specifications for this universal performance assessment and control system (UPACS). Features emphasized are the use of a real-time software operating system, distributed processing, and the IEEE 488-1975 Digital Interface for Programmable Instrumentation. A centralized minicomputer controls multiple distributed satellite processors by means of a multipoint asynchronous telemetry channel. All data acquisition takes place at the satellite terminals by controlling data acquisition devices connected to the IEEE 488 interface. A detailed description is given of hardware and operating system software. No specific data acquisition software is discussed. Author (GRA)

N77-30337# United Technologies Research Center, East Hartford, Conn.

LARGE-SIGNAL ESTIMATION FOR STOCHASTIC NONLINEAR MULTIVARIABLE DYNAMIC SYSTEMS Annual Technical Report, 1 Apr. - 31 Mar. 1977

Florence A. Farrar and Gerald J. Michael Mar. 1977 85 p refs

(Contract N00014-76-C-0710)

(AD-A040901; UTRC/R77-942577-6; ONR-CR-215-247-1) Avail: NTIS HC A05/MF A01 CSCL 12/1

Estimation algorithms for large-signal transient operation of nonlinear multivariable dynamic systems were developed and evaluated. Kalman methodology was employed in defining the filtering logic. Three estimation algorithms were defined based on representing the nonlinear system model by a reduced-order linear model, piecewise-linear model, and nonlinear model. Model-mismatch compensation techniques were established to account for the mismatch between the models in the filtering algorithms and the actual nonlinear system model. Filter gains for each algorithm were calculated off-line using modern state-space estimation techniques. An important constraint on the estimation algorithms is that their computational requirements be compatible with projected airborne digital computer capabilities. The estimation algorithms were evaluated and compared by application to noise-corrupted measurement data generated by a nonlinear digital dynamic F100/F401 engine simulation. Estimation of unmeasurable as well as measureable engine variables throughout the idle to military sea-level static operating regime (9 to 100 percent thrust) for large-signal transients was investigated. Measurable variables are available only through noisy sensors which contain inherent lags. On the basis of these noise-corrupted measurements, the filtering logic generates estimates of measurable and unmeasurable variables that are critical to satisfactory engine operation. Estimation of key engine variables from nominal-engine data, degraded-engine data and engine data with off-nominal noise statistics was evaluated.GRA

N77-30338# Ohio State Univ., Columbus. Electroscience Lab.

CONTINUATION OF THE INVESTIGATION OF THE MULTI-FREQUENCY RADAR REFLECTIVITY OF RADAR TARGET IDENTIFICATION Final Report, 10 Apr. 1972 - 30 Sep. 1976

C. D. Chuang, David L. Moffatt, Leon Peters, Jr., and Keith A. Shubert Mar. 1977 57 p refs

(Contract F19628-72-C-0203; AF Proj. 5635)

(AD-A040347; ESL-3424-7; RADC-TR-77-115) Avail: NTIS HC A04/MF A01 CSCL 17/9

Research on Contract No. F19628-72-C-0203 during the period 10 April 1972 to 30 September 1976 is summarized. Two subjects of significance to the Air Force, radar target identification and control of nonspecular scattering, have been studied. Progress in each area has been described in a series of Scientific Reports. These results are briefly summarized. More recent efforts, not yet completed, are discussed in more detail. Conclusions and recommendations for future research and implementation are made. Author (GRA)

N77-30339# Naval Research Lab., Washington, D. C. Radar Div.

ANGLE MEASUREMENTS FOR BROAD-BEAM-ARRAY RADARS Interim Report

Ben H. Cantrell 23 May 1977 27 p refs

(EF12151001)

(AD-A040984; NRL-8114) Avail: NTIS HC A03/MF A01 CSCL 17/9

This report describes the problems in measuring the angle of a target with broadbeam radars. It is shown that if the array is cross-level stabilized, reasonably good azimuth measurements can be made and the elevation measures are good except for about 7 to 8 degrees down to the horizon. For the situation with no cross-level stabilization present, two solution techniques were suggested. Author (GRA)

N77-30340# California Univ., Livermore. Lawrence Livermore Lab.

THE DERIVATION OF SIMPLE POLES IN A TRANSFER FUNCTION FROM REAL FREQUENCY INFORMATION. PART 3: OBJECT CLASSIFICATION AND IDENTIFICATION

E. K. Miller, J. N. Brittingham, and J. L. Willows 10 Jan. 1977 62 p refs

(Contract W-7405-eng-48)

(AD-A040640; UCRL-52211-Pt-3) Avail: NTIS HC A04/MF A01 CSCL 17/9

This report is the third in a series of three that evaluate a technique (frequency-domain Prony) for obtaining the poles of a transfer function. The main objective was to assess the feasibility of classifying or identifying ship-like targets by using pole sets derived from frequency-domain data. A predictor-correlator procedure for using spectral data and library pole sets for this purpose was developed. Also studied was an iterative method for reducing the effects of noise and a technique based upon magnitude-only spectral data. Author (GRA)

N77-30341# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Abt. Flugfunktechnik.

THE THEORY OF DIFFRACTION BY A PERFECTLY CONDUCTING WEDGE OF ARBITRARY ANGLE APPLIED TO ANTENNA PATTERNS

Nikolaos Stavropoulos 22 Feb. 1977 68 p refs In GERMAN; ENGLISH summary Report will also be announced as translation (ESA-TT-416)

(DLR-FB-77-05) Avail: NTIS HC A04/MF A01; DFVLR, Cologne DM 33.20

The complex integral equation derived from the theory of diffraction of light at a wedge limited by two perfectly conducting half planes is dealt with. (W. Pauli, 1938). This theory was applied to an electromagnetic wave and further developed and improved. The general complex integral equation of diffraction is stated, plotted numerically, and examined for the exterior as well as for the interior wedge. In case of a spherical incoming wave a number of far field diagrams of diffraction are plotted. The electrical field intensity is polarized vertically or horizontally to the edge. The fields are calculated for a vertical incidence of the spherical wave to the edge, for a distance from radiation point of 3 lambda and for several incidence angles to one half plane. The radiation fields of a mono- respectively dipole are calculated using the diffraction field in the presence of a conducting plate with finite dimensions, of a rectangular conducting parallelepiped and of a 120 deg respectively 270 deg corner reflector. The theoretical results are partly compared with experimentally obtained patterns. Author (ESA)

N77-30342# Dornier-System G.m.b.H., Friedrichshafen (West Germany).

REMOTE PRINTING IN EUROPE VIA SATELLITE. VOLUME 1: SUMMARY Final Report

H. Schuessler, K. L. Bitzer, W. Gieraths, Henri DeBodinat, Chris Heath, Arthur Owen, Martyn Roetter, Tom Sommerlatte, Leif Lundquist, and I. K. Vogel Jan. 1977 76 p Prepared jointly with Arthur D. Little Ltd., London, COMRECO AB., and VALVO GmbH 3 Vol.

(Contract ESA-SC/100-HQ)

(ESA-CR(P)-927-Vol-1) Avail: NTIS HC A05/MF A01

Results are summarized of a study on possible satellite data transmission systems serving the communication needs of the press and other information distributing organizations. Potential traffic over satellite channels was analyzed. Out of eight possible telecommunications services, two services were identified, which

have sufficient bandwidth requirements to justify a separate satellite service, and which would benefit from a satellite system both in terms of operational and cost reasons. The most important of these is a wideband information (teletext) service, a high speed one-way retrieval system allowing retrieval of pages of information on an ordinary TV screen. The other is full page facsimile transmission, or remote printing for newspapers. ESA

N77-30343# Little (Arthur D.) Ltd., London (England).
REMOTE PRINTING IN EUROPE VIA SATELLITE. VOLUME 2: IDENTIFICATION OF POTENTIAL USERS AND TRAFFIC ANALYSIS
Mar. 1977 66 p Prepared jointly with Dornier System 3 Vol.
(Contract ESA-SC/100-HQ)
(ESA-CR(P)-927-Vol-2) Avail: NTIS HC A04/MF A01

Analyses and conclusions are reached on the potential traffic over satellite channels which are provided to meet the communication needs of newspaper publishers and news agencies within the area to be served in the 1980's by the European Communications Satellite. These needs include the broadcast dissemination of news and information, the interchange of textural and photographic material, and the transmission of material to centralized or remote printing plants. ESA

N77-30344# Dornier-System G.m.b.H., Friedrichshafen (West Germany).
REMOTE PRINTING IN EUROPE VIA SATELLITE. VOLUME 3: SYSTEM ANALYSIS Final Report
H. Schuessler, K. L. Bitzer, W. Gieraths, Henri DeBodinat, Chris Heath, Arthur Owen, Martyn Roetter, Tom Sommerlatte, Leif Lundquist, and I. K. Vogel Jan. 1977 246 p refs Prepared jointly with Arthur D. Little Ltd., London, COMRECO AB., and VALVO GmbH 3 Vol.
(Contract ESA-SC/100-HQ)
(ESA-CR(P)-927-Vol-3) Avail: NTIS HC A11/MF A01

An analysis is presented of possible satellite data transmission systems serving the communication needs of the press and other information distributing organizations. Out of eight possible telecommunications services, two services were identified, which have sufficient bandwidth requirements to justify a separate satellite service, and which would benefit from a satellite system both in terms of operational and cost reasons. Multiple access and transmission requirements are analyzed, and possible configurations of earth stations are considered. The preferred solution is a TDMA system with a PCM signal encoding and redundancy reduction by source encoding. ESA

N77-30345# Harry Diamond Labs., Adelphi, Md.
THE PLACER: ASSEMBLY AND OPERATION
Daniel L. Goodwin Apr. 1977 23 p ref
(AD-A039997; HDL-TM-77-7) Avail: NTIS HC A02/MF A01 CSCL 20/3

This report describes the assembly and operation instructions of the PLACER, a test system for discovering and locating electromagnetic-pulse shielding flaws in underground conduits. Author (GRA)

N77-30346# Naval Postgraduate School, Monterey, Calif.
INTERVAL MODULATION (IM) OF A SINUSOIDAL CARRIER
Glen A. Myers and Edgar Leslie Kilborn, Jr. Feb. 1977 68 p refs
(AD-A039512; NPS-62MV77031) Avail: NTIS HC A04/MF A01 CSCL 20/14

Interval Modulation (IM) of a sinusoidal carrier is a modulation technique unlike AM, FM, or PM. IM conveys the information of a message waveform by modulating an interval between bursts of a sinusoidal carrier. IM is accomplished by sampling the message waveform, producing a delay proportional to the amplitude of the sampled message waveform and, upon the completion of the delay, initiating a burst of a fixed number of full cycles of a sinusoidal carrier. With the completion of the burst, another sample of the message waveform is taken and the sequence of events repeats. Because the length of a burst is fixed and because the delay between bursts is dependent upon the sampled value of the message waveform, the IM signal is non-periodic. An analysis is made of the IM signal modulated by a constant voltage modulating waveform and by general modulating waveforms. Descriptions are given for the circuits used in generation and detection of the IM signal. IM signal parameters are also considered for use with message waveforms in the audio frequency range. Author (GRA)

N77-30347# Aerospace Corp., El Segundo, Calif. Space Science Lab.
STIMULATION OF Pc 1 MICROPULSATIONS BY CONTROLLED VLF TRANSMISSIONS Interim Report
Harry C. Koons 7 Apr. 1977 28 p refs
(Contract F04701-76-C-0077)
(AD-A039264; TR-0077(2960-02)-2; SAMSO-TR-77-75) Avail: NTIS HC A03/MF A01 CSCL 20/14

Experiments designed to artificially generate ultra-low-frequency ULF waves were undertaken in conjunction with controlled very-low-frequency VLF wave transmissions conducted at Fort Richardson, Alaska. L approximately 4 Pc 1 micropulsations are believed to be produced by a Doppler-shifted, resonant interaction between Alfven waves and moderately-energetic, ringcurrent protons Jacobs, 1970. This interaction is analogous to the interaction between VLF Whistler-mode waves and energetic electrons. The interaction occurs between waves and particles traveling in 'opposite' directions along a magnetic field line. An anomalous interaction can also occur between VLF Whistler-mode waves overtaking protons traveling in the same direction along the magnetic field line. GRA

N77-30348# Rome Air Development Center, Griffiss AFB, N.Y.
A TIME DOMAIN PROGRAM FOR WIRE ANTENNA ANALYSIS Final Report
John Potenza Apr. 1977 143 p refs
(AF Proj. 4506)
(AD-A039509; RADC-TR-77-123) Avail: NTIS HC A07/MF A01 CSCL 09/5

This report discusses a user oriented computer routine to analyze antennas directly in the time domain. A number of sample cases were run and compared to previously published experimental results. A discussion of inputting data and output format is included to guide potential users. For the sake of completeness, a review of the time domain equations as well as the FORTRAN listing of the program are included. This information was published in a final report (1) and was distributed only to RADC and NRL, and is not available through DDC. GRA

N77-30349# Raytheon Co., Wayland, Mass.
KA-BAND ROOFTOP ANTENNA SUBSYSTEM Final Technical Report, 1 Nov. 1973 - 30 Sep. 1975
Edward M. Perdue and Thomas F. Joyce Jan. 1977 77 p
(Contract F33615-74-C-4012)
(AD-A039849; ER76-4103; AFAL-TR-76-27) Avail: NTIS HC A05/MF A01 CSCL 09/5

The technical report documents the development of a Ka-Band Rooftop Antenna Subsystem. The antenna subsystem is used in conjunction with the Ka-Band Satellite Communications Set AN/ASC-22 RF terminal and Digital Data Modem Group. The report contains a review and discussion of the design decisions, trade studies and problem areas encountered during the design. Author (GRA)

N77-30350# Johns Hopkins Univ., Baltimore, Md. Dept. of Psychology.
SELF-LIMITED AND UNLIMITED WORD USAGE DURING PROBLEM SOLVING IN TWO TELECOMMUNICATION MODES
W. Randolph Ford 1 Apr. 1977 41 p refs
(Contract N00014-75-C-0131)
(AD-A039955; TR-7) Avail: NTIS HC A03/MF A01 CSCL 17/2

Subjects using oral modes of communication generate far more verbiage than do subjects using written (handwritten or typewritten) modes to solve the same problems. This study was designed to provide support for one of two alternative hypotheses that have been proposed to account for this disparity: (1) written modes produce a hard copy of interchanges that can be referred to at any time, thereby compensating for the limitations of short-term memory and reducing the need to repeat information, and (2) talking is so much easier than handwriting or typewriting

that there is no incentive to be concise in oral modes. Two-person teams of subjects solved problems cooperatively using either a voice or a teletypewriter mode of communication. Half the teams were given a monetary incentive to use as few words as possible. No such request was made of the control teams. The main finding was that subjects in the brevity condition, regardless of the communication mode, greatly reduced verbiage with no increase in time or decrease in accuracy. Morever, subjects in the brevity-voice condition used even fewer words than did subjects in the control-teletypewriter condition. These results, then, lend weight to the second hypotheses.

Author (GRA)

N77-30351# Mitre Corp., Bedford, Mass.
SPECIAL - PURPOSE PROCESSORS FOR SURVEILLANCE RADAR APPLICATIONS
R. W. Jacobus and V. Kross May 1977 84 p refs
(Contract F19628-76-C-0001)
(AD-A039963; MTR-3365; ESD-TR-77-127) Avail: NTIS HC A05/MF A01 CSCL 17/9

Many track-while-scan surveillance systems utilize a large central computer to correlate the incoming sensor data with established tracks on targets of interest. These correlations must be done in near-real time at a high data rate and often consume a substantial fraction of the computer's CPU capacity; as a consequence, both the computer hardware and its software are expensive. Using the Joint Surveillance System (JSS), a radar network for continental air defense as a specific example, a special-purpose processor is described. It can be connected as a satellite to virtually any computer and can relieve the computer of the coordinate-conversion and track-correlation burden. The impact of the processor on reducing the hardware and software costs of the overall system is discussed. Author (GRA)

N77-30352# TRW Defense and Space Systems Group, Redondo Beach, Calif.
ULF GENERATED BY A SATELLITE-EMITTED BEAM Final Report
R. W. Fredricks 31 Jan. 1977 35 p
(Contract N00014-76-C-0671; DARPA Order 3188)
(AD-A039777; TRW-26766-6001-RU-00) Avail: NTIS HC A03/MF A01 CSCL 17/2

The work reported under this contract was motivated by the need to investigate possible LF systems that are capable of providing means to communicate with submerged submarines. Since ULF waves have a large skin depth in sea water, it seems natural to consider them for the stated purpose. A basis for the present work was formed in 1974 when TRW personnel performed preliminary calculations of generation of ULF signals by satellite-launched ion beams. The model used in the earlier calculations was a 'broad' ion beam. The term 'broad' means that finite beam radius effects were ignored. Thus, such an idealization, which is mathematically convenient, must lead to larger signals and higher efficiency than the realistic case of a beam of finite radial extent. Since the broad-beam calculation gave encouraging results, it was considered worthwhile to examine the finite-cross-section, or 'pencil' beam. The results of this analysis of a finite-radius beam of ions are presented. GRA

N77-30353# Naval Electronics Lab. Center, San Diego, Calif.
NAVY COMMAND CONTROL AND COMMUNICATIONS SYSTEM DESIGN PRINCIPLES AND CONCEPTS. VOLUME 1: C3 PRINCIPLES AND CONCEPTS
R. L. Goodbody and V. J. Monteleon 15 Aug. 1976 108 p refs
(AD-A039856; NELC/TD-504-Vol-1) Avail: NTIS HC A06/MF A01 CSCL 17/2

This is an eight-volume document of which volume I is a conceptual summary which can be used as a basic reference for Navy C3. It is a guide for developing unified global C3 networking which will ensure command survival and flexibility in a variety of operational environments. It provides a structure for the Navy C3 system for use in system engineering management. The executive summary gives the main points discussed in volume 1. Volume 2 is a glossary. Volumes 3 through 8 discuss in detail activities, methodologies, and planning considerations required for a successful implementation of the C3 concepts and philosophies contained in volume 1. Author (GRA)

N77-30354# Naval Postgraduate School, Monterey, Calif.
IMPLEMENTATION OF A SIDELOBE BLANKING SYSTEM ON THE AN/SPS-12 M.S. Thesis
Pedro Pablo Arancibia Mar. 1977 145 p refs
(AD-A039159) Avail: NTIS HC A07/MF A01 CSCL 17/9

A sidelobe blanking system can be looked upon as a method for maximizing main-lobe-detection and minimizing sidelobe detection. The system is intended to provide only main-beam signals and thereby producing unambiguous bearing information. The sidelobe blanking system turns the video off when the signal in an auxiliary antenna is stronger than the signal in the main antenna. Sidelobe blanking is best for pulse interference, and is not suitable for sidelobe noise jamming. In order to carry out experiments with sidelobe blanking a system was implemented on the AN/UPS-1 and AN/SPS-12 radar sets. The theory of sidelobe blanking and the design and implementation of the working circuits used is presented, together with pictures of the system and examples of the displayed signals and results.

Author (GRA)

N77-30355# Naval Postgraduate School, Monterey, Calif.
A DIFFUSION APPROXIMATION MODEL FOR A COMMUNICATION SYSTEM ALLOWING MESSAGE INTERFERENCE
Donald P. Gaver and John P. Lehoczky (Carnegie-Mellow Univ.) Feb. 1977 34 p refs
(AD-A039456; NPS-55-77-5) Avail: NTIS HC A03/MF A01 CSCL 17/2

Mathematical probability models are presented to describe the service furnished to messages approaching c communications channels, on which messages in progress may be 'destroyed' by an attempted access by a new message. Re-tries by destroyed messages are modeled. Numerical results, using the models, are compared to simulations, validating model usefulness.

Author (GRA)

N77-30356# Lehigh Univ., Bethlehem, Pa. Center for the Application of Mathematics.
ON THE SPEED OF PROPAGATION OF WAVES IN A DEFORMED ELASTIC MATERIAL
K. N. Sawyers and R. S. Rivlin Apr. 1977 38 p refs
(Contract N00014-76-C-0235)
(AD-A039682; CAM-100-27) Avail: NTIS HC A03/MF A01 CSCL 20/11

The secular equation is obtained for small amplitude waves propagated in an arbitrary direction in a body of incompressible isotropic elastic material subject to a pure homogeneous deformation. Conditions are obtained that the wave speeds be real. Author (GRA)

N77-30357# Hughes Aircraft Co., Culver City, Calif. Dept. of Display Systems and Human Factors.
VIDEO IMAGE BANDWIDTH REDUCTION/COMPRESSION STUDIES FOR REMOTELY PILOTED VEHICLES Final Technical Report, Jan. 1975 - May 1976
M. L. Hershberger and R. J. Vanderkolk Oct. 1976 142 p refs
(Contract F33657-75-C-0352)
(AD-A039762; HAC-P76-243R; HAC-D0470; ASD-TR-76-26) Avail: NTIS HC A07/MF A01 CSCL 17/2

A laboratory research and simulation program was conducted to evaluate and demonstrate methods of reducing video bandwidth to improve anti-jam capability of television data links. Four laboratory parametric studies were conducted using a remotely piloted vehicle simulator to establish the relationships between video bandwidth reduction techniques and RPV operator target acquisition performance. Nine bandwidth reduction/compression systems were selected based on the results of the parametric studies and compared to a standard IV baseline system in a laboratory systems simulation. A recommended video bandwidth reduction compression system was selected based on the results of the systems simulation, and a hardware implementation analysis of the recommended system was performed. GRA

N77-30358# Hughes Research Labs., Malibu, Calif.
SYSTEMATIC SURVEY OF NAVAL SURVEILLANCE AND COMMUNICATION SYSTEMS, PHASE 1 Final Report, 30 Sep. 1976 - 31 Mar. 1977

Paul Schwartz and Lynette Roth Mar. 1977 77 p refs
(Contract N00173-76-C-0389)
(AD-A039661) Avail: NTIS HC A05/MF A01 CSCL 17/2

This report contains a survey of the properties of Josephson-effect devices and an evaluation of their potential utility in Naval surveillance and communication systems. Emphasis was placed on finding an existing system that could be retrofitted to improve performance. The study focused on receiver front-end characteristics and signal-processing applications. Recommendations were made for the development of a superconductive front-end for millimeter-wave applications or the development of an integrated high-speed signal-processing capability.
Author (GRA)

N77-30359# General Research Corp., McLean, Va. Washington Operations.
COAT: MODEL-ZONAL COMPARISON
J. Radley, Iy. Nomiyama, J. Wilson, and G. Gurski Aug. 1976 110 p
(Contract N60921-76-C-0122)
(AD-A036302) Avail: NTIS HC A06/MF A01 CSCL 17/8

The objective of this program was to assess the effects of target- coat interactions comparing modal multidither with zonal multidither and phase-conjugate systems. A potential problem exists when target modulation overlaps the coat sensing bandwith, causing erroneous control signals to be generated. Differences in modal and zonal transmitters are of potential importance in closed-loop performance with distributed targets. The performance of a modal multidither Coherent Adaptive Optics Techniques coat system is investigated via simulations with distributed dynamic targets. Target influence on performance is shown to be similar to that of zonal systems in that target effects can degrade and prevent convergence. However, additional design alternatives are shown to be possible with a modal system that cannot be achieved with a zonal system. GRA

N77-30360# Nuclear Regulatory Commission, Washington, D.C. Office of Standards Development.
BASIC CONSIDERATIONS FOR ASSEMBLING A CLOSED-CIRCUIT TELEVISION SYSTEM
James A. Prell May 1977 50 p refs
(PB-268480/1; NUREG-0178) Avail: NTIS HC A03/MF A01 CSCL 17B

Special emphasis has been placed on the use of CCTV systems for security applications, but the information presented is also applicable to non-security uses. All factors of a CCTV system are covered in sufficient detail so that a potential user is not totally dependent upon the manufacturer for the selection and maintenance of his CCTV system. GRA

33 ELECTRONICS AND ELECTRICAL ENGINEERING

Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry.

For related information see also *60 Computer Operations and Hardware* and *76 Solid-State Physics*.

N77-30361 University of South Florida, Tampa.
ELECTRICAL AND NOISE PROPERTIES OF VACUUM DEPOSITED THIN GERMANIUM FILMS Ph.D. Thesis
Lai-Wang Chen 1976 218 p
Avail: Univ. Microfilms Order No. 77-9259

The excess noise generated in germanium film and the contact noise generated in the contacts between the metal and the Ge film, as well as the electrical properties of Ge film were investigated. Measurements of the Hall effect parameters, and the resistivity of the Ge films indicate that a film deposited at a higher substrate temperature has a lower majority carrier concentration and resistivity, but higher Hall coefficient and mobility. The excess noise generated in Ge films was found to decrease as the deposition substrate temperature was increased. A technique is described for measuring the contact noise voltage. Dissert. Abstr.

N77-30362 Illinois Univ., Urbana-Champaign.
COMPUTER-AUTOMATED ELECTRICAL CHARACTERIZATION OF SEMICONDUCTOR DEVICES Ph.D. Thesis
Thomas Ying-Ching Lo 1976 125 p
Avail: Univ. Microfilms Order No. 77-9080

The high frequency capacitance and the conductance methods of interface state density measurements on MOS capacitors are discussed theoretically and illustrated experimentally using the on-line computer system. Trapping center and shallow doping impurity concentration in the bulk of silicon are evaluated. The theory which takes into account the the edge effect is verified by a series of such measurements employing gold-doped n-type Schottky barriers. The data acquisition and analysis system which automates the three semiconductor device characterization techniques is described. This system is designed to be flexible so that any kind of electrical measurement and data analysis program can be implemented if sampling speed is not crucial.
Dissert. Abstr.

N77-30363 Illinois Univ., Urbana-Champaign.
THE DESIGN OF ALTERNATIVE LOGIC SYSTEMS WITH FAULT DETECTION CAPABILITIES Ph.D. Thesis
Dennis Andrew Reynolds 1976 145 p
Avail: Univ. Microfilms Order No. 77-9155

A design technique which achieves its fault detection capability utilizing a redundancy in time instead of the more conventional space redundancy, based on the successive execution of a required function and its dual, is described. In combinational networks the method involves the utilization of a self-dual function to represent the required function and the realization of the self-dual function in a network with structural properties which are sufficient to guarantee the detection of all single faults. Necessary and sufficient structural properties for any alternating network to be capable of detecting all single faults are derived. The application of alternating logic design to synchronous sequential machines and the use of alternating modules as basic design elements are examined. Dissert. Abstr.

N77-30364 Florida Univ., Gainesville.
A USER ORIENTED METHOD FOR TRANSMISSION SYSTEM PLANNING USING INTERACTIVE GRAPHICS Ph.D. Thesis
Hans Bjorn Puttgen 1976 233 p
Avail: Univ. Microfilms Order No. 77-6898

Simplification of a power transmission network's true nonlinear ac low-flow equation was acomplished by a technique that can handle both the voltage magnitudes and phases. Sensitivity coefficients are used that relate bus voltage changes with respect to changes in the admittance of any existing or fictitious element. These sensitivity coefficients are obtained using an adjoint network approach. It was found that the solutions to two different adjoint networks are necessary when the nonlinear power sources and loads are introduced. However, it is shown that the two solution procedures can be combined into just one forward-backward substitution operation on a set of linear equations. These sensitivity coefficients will be used to, first, evaluate network contingencies without actually performing the ac load-flow simulation, and second, to update the system's element admittances in order to improve its electrical behavior if it is unsatisfactory. The resulting theory is implemented by a minicomputer-oriented system.
Dissert. Abstr.

N77-30365* National Aeronautics and Space Administration. Pasadena Office, Calif.
PHASE SUBSTITUTION OF SPARE CONVERTER FOR A FAILED ONE OF PARALLEL PHASE STAGGERED CONVERTERS Patent
W. T. McLyman (JPL) and Gene W. Wester, inventors (to NASA) (JPL) Issued 2 Aug. 1977 8 p Filed 10 Jun. 1976 Supersedes N76-31413 (14 - 22, p 2856) Sponsored by NASA
(NASA-Case-NPO-13812-1; US-Patent-4,039,925; US-Patent-Appl-SN-694855; US-Patent-Class-363-70; US-Patent-Class-307-64; US-Patent-Class-363-53) Avail: US Patent Office CSCL 09C

Failure detection and substitution of a spare module is provided in a system having a plurality of phase staggered modules connected in parallel to deliver regulated voltage from an unregulated source. Phase control signals applied to the active

converter modules are applied to the spare module through NOR gates associated with and disabled by the power output of respective modules such that failure of any one enables its phase control signal to be applied to the spare module, thus controlling the spare module to operate in the phase position of the failed module. A NAND gate detects when any one active module fails and enables a gate in the spare module, thus activating the spare module.

Official Gazette of the U.S. Patent Office

N77-30366 Northwestern Univ., Evanston, Ill.
AUTOMATIC TEST GENERATION FOR LARGE DIGITAL CIRCUITS Ph.D. Thesis
Thomas George Hallin 1976 141 p
Avail: Univ. Microfilms Order No. 77-10033

An automatic test generation system which is capable of generating tests to detectable single stuck-at faults for arbitrarily large clocked sequential circuits with control write and read access to most memory elements is presented. The circuit model allows gates to have either unit or zero delay. To generate tests, the circuit is automatically partitioned into modules where each module is sufficiently small to allow existing automatic test generation techniques to work. Equations are generated for the modules to describe the behavior of the module in terms of inputs to the module. Finally tests are generated for the circuit based on the module equations. Dissert. Abstr.

N77-30367*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
CONCEPT REPORT: MICROPROCESSOR CONTROL OF ELECTRICAL POWER SYSTEM
Eugene Perry Aug. 1977 22 p
(NASA-TP-1016; M-227) Avail: NTIS HC A02/MF A01 CSCL 09C

An electrical power system which uses a microprocessor for systems control and monitoring is described. The microprocessor controlled system permits real time modification of system parameters for optimizing a system configuration, especially in the event of an anomaly. By reducing the components count, the assembling and testing of the unit is simplified, and reliability is increased. A resuable modular power conversion system capable of satisfying a large percentage of space applications requirements is examined along with the programmable power processor. The PC global controller which handles systems control and external communication is analyzed, and a software description is given. A systems application summary is also included. B.B.

N77-30368*# Westinghouse Electric Corp., Lima, Ohio. Aerospace Electrical Div.
AEROSPACE TECHNOLOGY DEVELOPMENT OF SOLID STATE REMOTE POWER CONTROLLERS FOR 300 VDC WITH CURRENT RATINGS OF ONE AND TWO AMPERES, ONE TYPE HAVING CURRENT LIMITING
W. W. Billings Jun. 1977 183 p
(Contract NAS3-20083)
(NASA-CR-135199; WAED-77-01E) Avail: NTIS HC A09/MF A01 CSCL 09A

Two types of transistor remote power controllers (RPC) for 270/300 Vdc spacecraft distribution systems were developed, built, and fully tested. Simple, efficient (99%), reliable and relatively low cost RPC designs are described with test results. The 1 ampere design (TYPE A) is capable of limiting maximum overload current to 3 amperes for .1 second and the 2 ampere non current limiting design (Type 2); provides instant tripping at 10 amperes and above. Each design provides overcurrent protection through an inverse I squared t trip out function with a fail-safe device back-up. All designs have demonstrated step applied fault capability with a fast risetime (low inductance) power source. They have also been demonstrated to meet MIL-STD-704B specification for power quality + or - 1000V transient immunity, and compatibility with anticipated loads. An evaluation of fuse operations with 300Vdc/4000A sources has shown the compliance of two candidate types to RPC applications. The study of technology limitations revealed several areas that if implemented with improve performance, cost, reliability, capability and size of not only high voltage DC RPC's but also lower voltage devices. Author

N77-30369*# Westinghouse Electric Corp., Lima, Ohio. Aerospace Electrical Div.
AEROSPACE TECHNOLOGY DEVELOPMENT OF THREE TYPES OF SOLID STATE REMOTE POWER CONTROLLERS FOR 120 VDC WITH CURRENT RATINGS OF FIVE AND THIRTY AMPERES, ONE TYPE HAVING CURRENT LIMITING
J. T. Mitchell Jun. 1977 272 p ref
(Contract NAS3-17771)
(NASA-CR-135216; WAED-77-05E) Avail: NTIS HC A12/MF A01 CSCL 09A

Three types of transistor Remote Power Controllers (RPC's) for 120V spacecraft distribution systems have been developed, built and fully tested. Simple, efficient (99%), reliable, and relatively low cost RPC designs are described with test results. Each design provides tripoff protection for overloads. All designs have demonstrated compatibility with 4000 Ampere, low inductance sources. Significant tests performed were: static, dynamic, temperature, faults, transients, and load compatibility performances. Author

N77-30370*# Westinghouse Defense and Electronic Systems Center, Baltimore, Md. Systems Development Div.
THE 12 GHz MIXER/LOCAL OSCILLATOR AND PARAMETRIC AMPLIFIER Final Report, Jun. 1974 - Dec. 1975
Lawrence E. Dickens Nov. 1976 90 p refs
(Contract NAS5-20524)
(NASA-CR-152584; Rept-76-1035) Avail: NTIS HC A05/MF A01 CSCL 09A

The results of the initial implementation of the proposed design, the design modifications, and limitations are presented. Also included are data on component parts of the breadboard amplifier and the converter. Author

N77-30371# Auburn Univ., Ala. Dept. of Electrical Engineering.
DEVELOPMENT OF TECHNIQUES AND PROCEDURES FOR ADVANCED TOOL DEVELOPMENT Final Technical Report
B. D. Carroll, K. B. Cook, G. R. Kane, H. T. Nalge, and T. D. Slagh 1977 265 p refs
(Contract DAAH01-76-C-03281)
(AD-A039503; AU-EE-AMC-76-03281) Avail: NTIS HC A12/MF A01 CSCL 09/5

This report investigates the problems involved in implementing hybrid integrated circuits. Its nine separate parts address hybrid integration, computer-aided thermal modeling, thermal simulation, thermal analysis and measurement, thick film resistor noise, noise in optical isolators, automated conductor routing, interactive schematic generation, and computer aided design. Author (GRA)

N77-30372# Army Mobility Equipment Research and Development Center, Fort Belvoir, Va. Electrical Power Lab.
SYNCHRONOUS ALTERNATOR ANALYSIS Technical Report, Jan. 1974 - Jun. 1976
Melvin L. Goss Oct. 1976 87 p refs
(DA Proj. 1G7-62708-A-1167)
(AD-A039235; MERADCOM-2193) Avail: NTIS HC A05/MF A01 CSCL 10/2

A two-dimensional analysis of the cross section of a salient-pole, synchronous aircraft alternator under no load is reported. The nonlinear effects of magnetic saturation were considered. The solution algorithm is a modified version of an algorithm previously used in the analysis of nonlinear, homopolar-inductor alternators. The details of the algorithm and the computer programs implemented on a minicomputer were described in earlier MERADCOM reports. This report contains teletypewriter terminal printouts of actual minicomputer runs. A solution of the magnetic flux analysis was reached, but the number of iterations required to reach the solution indicates that problems remain in optimizing the numerical analysis used in the algorithm. Author (GRA)

N77-30373# Army Electronics Technology and Devices Lab., Fort Monmouth, N. J.
A HALF MEGAWATT PULSE FORMING NETWORK (PFN)
J. E. Creedon and R. A. Fitch (Maxwell Labs., San Diego, Calif.) Apr. 1977 9 p
(DA Proj. 1L7-62705-A-1194)

(AD-A039709; ECOM-4494) Avail: NTIS HC A02/MF A01 CSCL 10/3

A lightweight half megawatt average power pulse forming network (PFN) designed a store 4 kilojoules (kJ) at 40 kilovolts has been developed. The energy storage system produces a 10 microsecond pulse at a repetition rate of 125 hertz and has a one ohm impedance. It is designed to operate adiabatically for durations of 60 seconds. A lifetime capability of over 400,000 pulses has been demonstrated. Author (GRA)

N77-30374# Erie Technological Products of Canada Ltd., Ottawa, (Ontario).

MANUFACTURING METHODS AND TECHNIQUES FOR MINIATURE HIGH VOLTAGE HYBRID MULTIPLIER MODULES Quarterly Report, 12 Jul. - 30 Sep. 1976

Andrew Kennedy 10 Jan. 1977 75 p

(Contract DAAB07-76-C-0041)

(AD-A039218; QR-1) Avail: NTIS HC A04/MF A01 CSCL 09/5

This First Quarterly Report for Contract DAAB07-76-C-0041 describes the progress and status of this program to establish cost-effective production capability for Miniature High Voltage Multiplier Modules for use in power supplies. A brief description of the PERT Chart is given and the initial design work on capacitors, rectifiers and substrates, is described. Author (GRA)

N77-30375# Raytheon Co., Quincy, Mass. Industrial Components Operation.

MANUFACTURING METHODS AND TECHNOLOGY ENGINEERING (MM AND TE) PROGRAM FOR THE ESTABLISHMENT OF PRODUCTION TECHNIQUES FOR HIGH DENSITY THICK FILM CIRCUITS USED IN CRYSTAL OSCILLATORS Quarterly Progress Report, 6 Aug. - 21 Nov. 1976

Charles T. Martin 30 Dec. 1976 79 p refs

(Contract DAAB07-76-C-8119)

(AD-A039590; QPR-1) Avail: NTIS MF A01 CSCL 09/5

Production techniques are being established for a thick film hybrid microelectronic 17-22 MHz, temperature-compensated, voltage-controlled crystal oscillator. The program requirements, the plan for meeting those requirements, the technical approach being pursued and the technical work that has been accomplished are described. The program is subdivided into an engineering phase and a production phase. The engineering phase was started, with the following being accomplished during this reporting period: the configuration design of the TCVCXO module, the detailed layout design of the hybrid microcircuitry used in the TCVCXO module, the detailed design of piece-parts to be used in hermetically sealing the hybrid microcircuits and encapsulating the modules, the breadboard analysis of the TCVCXO electrical design, the establishment of process flow plans for producing the modules, and the selection and procurement of component parts and materials for the construction of the TCVCXO modules. Details of this work are reported. Author (GRA)

N77-30376# RCA Solid State Technology Center, Somerville, N. J.

HIGH-RELIABILITY, LOW COST INTEGRATED CIRCUITS Final Report, 3 Feb. 1976 - 3 Feb. 1977

3 Feb. 1977 100 p ref

(Contract N00039-76-C-0240; XF54586002)

(AD-A039954) Avail: NTIS HC A05/MF A01 CSCL 09/5

The objective of Phase 1 of this investigation was to develop process feasibility, processing techniques, and automated assembly technology for dual-in-line plastic-packaged integrated circuits. Eight IC's were processed with trimetal interconnections, gold bond bumps and silicon nitride dielectric overcoating. These included three CMOS TTL circuits (5420, 5472, 5470), one Schottky TTL circuit (54S20), three circuits (CD4012B, CD4014A, CD4027A), and one linear circuit (CA741). A universal wafer processing sequence compatible with the requirements of each device type was developed. Electrical parameter specifications were met successfully for each device type. Critical wafer-processing steps have been investigated to determine reproducibility and effects on yield, cost, and reliability. Beam tapes were fabricated from polyimide supported copper and conditions for reproducibly high-strength inner-lead bonds to the device were established. Similarly, outer-lead bonding to plated steel or copper alloy lead frames on high speed automated equipment was facilitated. High-temperature accelerated reliability tests were initiated and problems related to the package materials of construction were analyzed and resolved. Author (GRA)

N77-30377# Varian Associates, Palo Alto, Calif.

IMPROVED DUAL-MODE ELECTRON GUN Technical Report, Apr. - Dec. 1976

Fredrik Bjornstad Griffiss AFB, N.Y. RADC Mar. 1977. 42 p ref

(Contract F30602-76-C-0177; AF Proj. 5573)

(AD-A039187; RADC-TR-77-95) Avail: NTIS HC A03/MF A01 CSCL 09/1

An advanced non-intercepting gridded gun was designed, fabricated, and preliminary tested. The use of magnetic flux in the cathode region preserves the beam diameter when the grid voltage is reduced for a lower power mode of operation. This will result in a more stable TWT performance, since the gain difference associated with the two modes is significantly reduced. Author (GRA)

N77-30378# Naval Research Lab., Washington, D. C. Plasma Physics Div.

SECONDARY ELECTRON SUPPRESSION IN CHARGE COLLECTORS AND ANALYZERS Interim Report

B. H. Ripin and R. Decoste (Md. Univ., College Park) May 1977 11 p refs Sponsored in part by ERDA

(AD-A040258; NRL-MR-3494) Avail: NTIS HC A02/MF A01 CSCL 20/3

A modification of the simple parallel plate electrostatic analyzer is described which allows suppression of secondary particles without electrodes within the particle flux and allows relatively easy measurements of secondary emission coefficients. Author (GRA)

N77-30379# Westinghouse Defense and Electronic Systems Center, Baltimore, Md. Systems Development Div.

MNOS BORAM MANUFACTURING METHODS AND TECHNOLOGY PROJECT Quarterly Technical Progress Report, 1 Oct. - 31 Dec. 1976

J. E. Brewer, T. G. ODonnell, P. C. Smith, and L. A. Epstein Dec. 1976 56 p

(Contract DAAB07-76-C-0048)

(AD-A040400; Rept-77-0308; QTPR-2) Avail: NTIS HC A04/MF A01 CSCL 09/2

A manufacturing methods project has been initiated to establish a pilot production line for metal nitride oxide semiconductors (MNOS) block oriented random access memory (BORAM) multichip hybrid circuits. During the past quarter the hybrid circuit configuration was finalized, electrical test procedures were defined, and a new low cost MNOS die was fabricated. In addition process studies were continued, and the results of Auger analysis were summarized. Author (GRA)

N77-30380# California Univ., Livermore. Lawrence Livermore Lab.

IC INSPECTION TEST MASKS: EXPERIMENTAL RESULTS

D. R. Ciarlo 14 Feb. 1977 63 p refs

(Contract W-7405-eng-48)

(UCID-17391) Avail: NTIS HC A04/MF A01

Integrated circuit inspection test photomasks were scanned with four automated inspection systems to determine if these masks could be used to test and calibrate automated inspection systems. It was found that the dimensions on the background die pattern of such masks must be accurate before an automated system, especially a scanning type, can be used to inspect them. When adjustments were made for the stepping error by the operator, an automated system found nearly twice as many defective die as were found during a manual inspection of the same mask. A better way to achieve randomly positioned defects would be to make them with a laser scribing machine and with chrome patching. Randomly positioned defects are desired if an automated inspection system is to be compared with a manual scan technique. If all that is desired is the calibration of the automated system, then the defects can be positioned in a regular manner but there must be a large number of them in a variety of sizes so that detection statistics can be accumulated. ERA

N77-30381# National Physical Lab., Teddington (England). Div. of Numerical Analysis and Computing.
CAPACITANCE OF COAXIAL LINES WITH STEPS AND TAPERS
G. T. Symm Feb. 1977 12 p refs
(NPL-NAC-74) Avail: NTIS HC A02/MF A01

For a uniform rotationally symmetric coaxial line, the capacitance per unit length is known analytically. The purpose of the present investigation is to compute the capacitance of lengths of rotationally symmetric coaxial lines in which one or both of the conductors have a step and/or a taper. Each of these lengths terminates in sections of uniform lines, the analytic capacitance of which is subtracted off to give the relevant discontinuity capacitance. A specific application of this work is described by Clarke (1977). Author (ESA)

N77-30382# Ticra A/S, Lyngby (Denmark).
COMPUTER PROGRAMS FOR GENERAL REFLECTOR ANTENNA SYSTEMS AND SPHERICAL WAVE EXPANSION Final Report
Peter Balling and Knud Pontoppidan Feb. 1977 67 p refs
(Contract ESTEC-2646/76-NL-AK)
(S-56-02; ESA-CR(P)-939) Avail: NTIS HC A04/MF A01

The theory for the analysis of very general reflector antenna systems is developed and an associated computer program (GRASP) is constructed. The physical optics method is applied. Compared to previous computer programs, a number of extensions are carried out to obtain a high degree of generality and flexibility. Various types of reflector surfaces and feed patterns are incorporated in the program package. Far-field patterns as well as finite-range patterns may be calculated. A spherical wave expansion program (SWE) is developed. This program determines the spherical wave coefficients for a given feed pattern which may be measured or calculated. Hence, it is possible to perform an accurate determination of the incident field on the reflector surface in cases where this is located in the near field of the feed. Author (ESA)

N77-30383# Naval Civil Engineering Lab., Port Hueneme, Calif.
TECHNIQUES FOR TRANSFER IMMITTANCE MEASUREMENTS Technical Note, Jul. 1974 - Aug. 1976
K. T. Huang and D. M. Shiroma Mar. 1977 33 p refs
(AD-A039181; CEL-TN-1473) Avail: NTIS HC A03/MF A01 CSCL 20/3

High frequency injection and electromagnetic coupling techniques are developed for measuring the transfer immittance of a power element. Techniques for producing artificial open and short circuits, which allows testing of power elements while in normal operation on-line, are described. An example is provided, giving the instrumentation and procedures for determining the transfer immittances of a two-port network. Author (GRA)

N77-30384# Naval Postgraduate School, Monterey, Calif.
DIELECTRIC LOADED FINNED WAVEGUIDE STUDY Final Report, 1 Jan. - 31 Mar. 1977
Jeffrey B. Knorr Mar. 1977 54 p refs
(AD-A039172; NPS-62K077031A) Avail: NTIS HC A04/MF A01 CSCL 20/14

This report presents an analysis of rectangular waveguide with centered, zero thickness ridges (fins) backed by a dielectric substrate. Design curves are given for the 26.5-40 GHz and 40-60 GHz waveguide bands for the case where the dielectric has a thickness of 5 mils and epsilon sub r = 2.2. Elements of simulation in general and of electronic warfare EW in particular are presented. In the area of EW simulation, radio frequency RF stimulation is emphasized. A survey of four current or proposed EW simulators is presented. Finally, desirable features to look for in an EW simulator are discussed. Author (GRA)

N77-30385# Raytheon Co., Waltham, Mass. Research Div.
MANUFACTURING METHODS AND TECHNOLOGY MEASURE FOR ARC-PLASMA-SPRAYED PHASE-SHIFTER ELEMENTS Quarterly Progress Report, 1 Jan. - 31 Mar. 1977
H. J. VanHook Apr. 1977 74 p
(Contract DAAB07-75-C-0043)
(AD-A040709; QPR-7) Avail: NTIS HC A04/MF A01 CSCL 09/5

Twenty confirmatory samples and reports were delivered on January 30. Hysteresis loop and microwave testing at Raytheon and confirming measurements at ECOM Laboratories indicate the samples meet or exceed contract requirements. Differential phase shift on 10 test elements averages 384 degrees, compared with the >340 degrees specified. The average insertion loss on these 10 elements was 1.04 dB, which compares with a contract goal of 1 dB or less. Author (GRA)

N77-30386# Rensselaer Polytechnic Inst., Troy, N. Y. Dept. of Mathematical Sciences.
FREQUENCY ENTRAINMENT OF A FORCED VAN DER POL OSCILLATOR Interim Report
Joseph E. Flaherty and F. C. Hoppensteadt Apr. 1977 26 p refs
(Grants AF-AFOSR-2818-75; DAAG29-74-G-0219)
(AD-A039211; AFOSR-77-0615TR) Avail: NTIS HC A03/MF A01 CSCL 09/5

A van der Pol relaxation oscillator that is subjected to external sinusoidal forcing can exhibit stable and unstable periodic and almost periodic responses. For some forcing amplitudes it even happens that two stable subharmonics having different periods may coexist. The stable responses of such forced oscillators are investigated. By numerically computing the rotation number of stable oscillations for various values of the forcing amplitude and oscillator tuning, descriptions are obtained of regions of phase locking, successive bifurcation of stable subharmonic and almost periodic oscillations, and overlap regions where two distinct stable oscillations can coexist. GRA

N77-30387# Stanford Research Inst., Menlo Park, Calif.
ELECTRONICALLY TUNABLE UHF HIGH-POWER FILTER Final Technical Report, 4 May 1976 - 3 Feb. 1977
Arthur Karp May 1977 76 p refs
(Contract F30602-76-C-0248)
(AD-A040469; RADC-TR-77-167) Avail: NTIS HC A05/MF A01 CSCL 09/5

This report describes a research and development program that established the feasibility of a low-loss, high-power UHF resonator with electronic tuning means based on the 'L-Flauto' principle. This principle provides for changing the resonant frequency of a transmission-line cavity in discrete steps by using arrays of PIN diodes to short out inductances that are in series with the line. In an appropriate design, N switched inductances would provide 2N tuning channels selectable under binary-logic control. This kind of resonator has application to interference reduction in frequency-agile Air Force communication systems, where it would be used as a fast-tuning bandpass filter or as a tank circuit for a transmitter output stage. GRA

N77-30388# Cober Electronics, Inc., Stamford, Conn.
HIGH VOLTAGE NANOSECOND PULSE GENERATORS Triannual Report, 30 Dec. 1976 - 30 Apr. 1977
Joseph Bajda and Stephen Geiger Jun. 1977 28 p
(Contract DAAB07-77-C-2641)
(AD-A040420; ECOM-77-2641-1; TAR-1) Avail: NTIS HC A03/MF A01 CSCL 09/3

The objective of the development is a set of pulse generators of small volume, low weight, and high efficiency. The design for Task A Pulse Generator, operating either single pulse or 15 Hz, at a pulsewidth of 125 ns, pulse voltage of 30 kV, and pulse current of 1200 amps, has been completed. Switches to meet the lower voltage, higher speed requirements of pulse generators for Tasks B and C will be evaluated in tests circuits. GRA

N77-30389# Harvard Coll. Observatory, Cambridge, Mass. Center for Astrophysics.
THE DEVELOPMENT AND TEST OF SEALED MULTI-ANODE DETECTORS BASED ON MICROCHANNEL ARRAY PLATES FOR USE AT ULTRAVIOLET WAVELENGTHS Final Report, May 1975 - Dec. 1976
J. G. Timothy Feb. 1977 72 p refs
(Contract F19628-75-C-0165)
(AD-A040918; AFGL-TR-77-0084) Avail: NTIS HC A04/MF A01 CSCL 09/1

An ultraviolet photon-counting detection system which uses a microchannel array plate and a cesium iodide photocathode is

described. The construction, mode of operation, and preliminary evaluation results are discussed. A.R.H.

N77-30390# Honeywell, Inc., Golden Valley, Minn.
PRODUCTION ENGINEERING MEASURE (PEM) MANUFACTURING METHODS AND TECHNIQUES FOR PIEZOELECTRIC TRANSFORMERS Quarterly Progress Report, 14 Oct. 1976 - 14 Jan. 1977
William B. Harrison, L. Hiltner, and W. Kammeyer 14 Jan. 1977 27 p
(Contract DAAB07-76-C-0008)
(AD-A040297; Rept-46585; QPR-6) Avail: NTIS HC A03/MF A01 CSCL 09/1

The report describes the progress and status of this program to establish a cost-effective production capability for 18mm and 25mm piezoelectric ceramic transformers. The construction status for the 30 confirmatory 18mm and 25mm PETs is reviewed in this report. GRA

N77-30391# International Nickel Co., Inc., New York.
NICKEL COMPOSITE MAGNETOSTRICTIVE MATERIAL RESEARCH FOR ULTRASONIC TRANSDUCER Final Report
D. T. Peters and E. L. Huston Jan. 1977 43 p refs
(Contract N00039-76-C-0017)
(AD-A040336) Avail: NTIS HC A03/MF A01 CSCL 09/1

The immediate objective was to manufacture and test a composite transducer material of the compound SmFe2 in a nickel matrix fabricated by a powder metallurgy technique. The long term objective was the effective utilization of a 'giant' magnetostrictive REFe2 material in a ductile and corrosion resistant composite for use as a transducer core material. Author (GRA)

N77-30392# RCA Labs., Princeton, N. J.
TRANSVERSE TELDS (TRANSFERRED-ELECTRON LOGIC DEVICES) Annual Report, 1 Dec. 1975 - 30 Nov. 1976
W. R. Curtice Mar. 1977 75 p refs
(Contract N00014-76-C-0465)
(AD-A040629; PRRL-77-CR-9) Avail: NTIS HC A04/MF A01 CSCL 09/5

The development of a computer-aided analysis for two-dimensional transient simulations of planar GaAs logic devices utilizing the transferred-electron effect is described. The effects of the semi-insulating substrate, diffusion, a Schottky-barrier gate, and the nonlinearity velocity-field relationship are included. The analysis is applied to two- and three-terminal GaAs devices. The switching properties of three-terminal devices are studied both for anode loading and cathode loading. A delay of about 30 ps is obtained with gain for anode loading and for above-threshold-value gate input voltage. Three designs of transverse-domain-spreading (TDS) logic devices useful for an exclusive-OR circuit are analyzed. The shortest output delay is 20 ps and occurs for a TDS device with a control anode and capacitive output electrode. Author (GRA)

N77-30292*# Sprague Electric Co., North Adams, Mass.
THE TANTALUM-CASED TANTALUM CAPACITOR
John D. Moynihan *In* NASA. Marshall Space Flight Center Proc. of the ASPE/MSFC Symp. on Eng. and Productivity Gains from Space Technol. May 1977 p 227-247 (For primary document see N77-30273 21-31)
Avail: NTIS HC A13/MF A01 CSCL 09A

N77-30293*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
USE OF HEAT PIPES IN ELECTRONIC HARDWARE
James R. Graves *In its* Proc. of the ASPE/MSFC Symp. on Eng. and Productivity Gains from Space Technol. May 1977 p 249-255 (For primary document see N77-30273 21-31)
Avail: NTIS HC A13/MF A01 CSCL 09C

N77-30294*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
SPACE POWER TECHNOLOGY APPLIED TO THE ENERGY PROBLEM
J. L. Miller and J. R. Morgan *In its* Proc. of the ASPE/MSFC Symp. on Eng. and Productivity Gains from Space Technol. May 1977 p 257-269 refs (For primary document see N77-30273 21-31)
Avail: NTIS HC A13/MF A01 CSCL 10A

N77-30295*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
SEMICUSTOM INTEGRATED CIRCUITS AND THE STANDARD TRANSISTOR ARRAY RADIX (STAR)
Teddy M. Edge *In its* Proc. of the ASPE/MSFC Symp. on Eng. and Productivity Gains from Space Technol. May 1977 p 271-289 (For primary document see N77-30273 21-31)
Avail: NTIS HC A13/MF A01 CSCL 09C

N77-30529*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ERRORS IN SHORT CIRCUIT CURRENT MEASUREMENTS DUE TO SPECTRAL MISMATCH BETWEEN SUNLIGHT AND SOLAR SIMULATORS
Henry B. Curtis *In its* Terrest. Photovoltaic Meas., 2 1976 p 161-182 ref Previously announced as N77-26620 (For primary document see N77-30521 21-42)
Avail: NTIS HC A17/MF A01 CSCL 10A

34 FLUID MECHANICS AND HEAT TRANSFER

Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.

For related information see also *02 Aerodynamics* and *77 Thermodynamics and Statistical Physics.*

N77-30393 Illinois Univ., Chicago.
REFLECTION OF ELASTIC AND PLASTIC ACCELERATION WAVES Ph.D. Thesis
John Charles Cizek 1976 124 p
Avail: Univ. Microfilms Order No. 77-6835

The reflected wave pattern produced when an acceleration wave is incident on a bounding surface of a homogeneously prestressed elastic plastic solid was investigated. An examination of a system of quasilinear first order partial differential equations which govern the motion of the medium under consideration are presented. The dependent variables are the components of particle velocity and the components of stress. Equations governing acceleration wave speeds and discontinuities are obtained by application of power series expansions of the dependent variables and functions of dependent variables about the wave front. The series are substituted into the governing partial differential equations, and coefficients of like power are equated. For an elastic or plastic wave the result is a system of homogeneous algebraic equations. Dissert. Abstr.

N77-30394 Colorado State Univ., Fort Collins.
THE INTERACTION OF GRAVITY WAVES AND TURBULENT CHANNEL FLOW Ph.D. Thesis
James Dougal Adrianus VanHoften 1976 139 p
Avail: Univ. Microfilms Order No. 77-6817

Modifications of waves due to wave-current interaction and the corresponding modification of the flow properties by the waves were studied. A theoretical model was developed to describe the energy dissipation in terms of measured wave and hydraulic flow parameters. Turbulent kinetic energy production was analyzed as a function of turbulent Reynolds stress and mean and wave-induced velocity gradients. Wave-current interactions were shown to significantly increase rates of wave energy dissipation. The decay of wave energy increased generally as wave steepness and flow velocity increased. Wave-induced velocities were shown to modify mean velocity gradients and existing turbulence quantities. Spectral quantities as well as phase averaged values showed a decrease in wave related activity as depth increased. Results suggested that surface waves extracted energy from the mean velocity gradient to produce turbulent energy that was diffused downward. Dissert. Abstr.

N77-30395 Florida Univ., Gainesville.
PERTURBATION THEORY FOR HIGH PRESSURE BEHAV-

IOR OF LIQUID MIXTURES Ph.D. Thesis
Chorng-Horng Twu 1976 232 p
Avail: Univ. Microfilms Order No. 77-8232

Pade approximant to the Helmholtz free energy was developed for mixtures of nonspherical molecules. Comparisons of the theory with computer simulation results show the equation to be highly accurate for fluids in which strong polar, quadrupolar or anisotropic overlap forces are present. The theory is shown to work well in both the gas and liquid states. Mixture properties calculated include the excess thermodynamic functions, the vapor-liquid coexistence curves (compositions and pressures), the liquid-liquid coexisting curves (where present), and the vapor-liquid critical loci. Comparisons of theory with experiment are reported for pure fluids, binary systems and ternary systems.
Dissert. Abstr.

N77-30396 Illinois Univ., Urbana-Champaign.
MECHANISM OF TURBULENT MASS TRANSFER TO A PIPE WALL AT HIGH SCHMIDT NUMBER Ph.D. Thesis
Dudley Arthur Shaw 1976 184 p
Avail: Univ. Microfilms Order No. 77-9184

The relationship of mass transfer rate to the flow fluctuations close to a wall was investigated. An electrochemical technique was used to measure the time averaged and fluctuating mass transfer coefficient at the wall. A linear model of the mass balance equation developed by Sirkar is presented and used to relate the mass transfer spectra to the spectrum of the velocity component perpendicular to the wall. Measurements of spectra show that while they can vary with Schmidt number, they always maintain a similar shape. This fact is used with the linear model to show how the low frequency portion and the relative intensity vary with Schmidt number. Measurements of the spatial correlation coefficient in the transverse direction indicate that the dominant eddies in the viscous sublayer are responsible for the turbulent mass transfer. Dissert. Abstr.

N77-30397 Illinois Univ., Urbana-Champaign.
THEORETICAL AND EXPERIMENTAL ANALYSIS OF THE CONSTANT-AREA, SUPERSONIC-SUPERSONIC EJECTOR Ph.D. Thesis
Clark Douglas Mikkelsen 1976 138 p
Avail: Univ. Microfilms Order No. 77-9100

A one-dimensional analysis of the constant-area, supersonic-supersonic ejector was made and incorporated with a one-dimensional analysis of the conventional constant-area, subsonic-supersonic ejector into a pumping system optimization procedure applicable to high-energy, chemical laser systems and supersonic wind tunnel systems. A comparison of optimum pumping system data shows that under certain conditions, a supersonic-supersonic pumping system has the potential for improved performance over that of a subsonic-supersonic pumping system. Dissert. Abstr.

N77-30398 Illinois Univ., Urbana-Champaign.
NUMERICAL SOLUTIONS OF NONLINEAR POTENTIAL FLOWS WITH FREE SURFACES Ph.D. Thesis
Terrence John Akai 1976 77 p
Avail: Univ. Microfilms Order No. 77-8911

A numerical method was developed for steady and unsteady potential flows involving uniform or accelerated motions of disturbances on or near the surface of a liquid in a gravitational field. The numerical method for solving this type of problem is to couple an explicit, single, second-order time integration scheme with the solution of the Laplace equation for the potential function. In this method, the free-surface properties are integrated to provide a Dirichlet condition at the surface for the Laplace equation, the Laplace equation is solved, and the solution is used together with the free-surface conditions to determine the derivatives necessary for another time integration. The time integration scheme is chosen so as to minimize the number of solutions of large algebraic systems of equations. The method was found to give accurate solutions when applied to a two-dimensional pressure distribution problem. Dissert. Abstr.

N77-30399* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
ACCUMULATOR Patent
James R. Fenwick (Rockwell Intern. Corp., Canoga Park, Calif.) and George H. Karigan, inventors (to NASA) (Rockwell Intern. Corp., Canoga Park, Calif.) Issued 2 Aug. 1977 5 p Filed 18 Dec. 1975 Supersedes N76-14418 (14 - 05, p 0579) Sponsored by NASA
(NASA-Case-MFS-19287-1; US-Patent-4,039,000;
US-Patent-Appl-SN-641802; US-Patent-Class-137-207;
US-Patent-Class-137-209; US-Patent-Class-62-55;
US-Patent-Class-60-259) Avail: US Patent Office CSCL 20D

An accumulator particularly adapted for use in controlling the pressure of a stream of fluid in its liquid phase utilizing the fluid in its gaseous phase was designed. The accumulator is characterized by a shell defining a pressure chamber having an entry throat for a liquid and adapted to be connected in contiguous relation with a selected conduit having a stream of fluid flowing through the conduit in its liquid phase. A pressure and volume stabilization tube, including an array of pressure relief perforations is projected into the chamber with the perforations disposed adjacent to the entry throat for accommodating a discharge of the fluid in either gaseous or liquid phases, while a gas inlet and liquid to gas conversion system is provided, the chamber is connected with a source of the fluid for continuously pressuring the chamber for controlling the pressure of the stream of liquid.
Official Gazette of the U.S. Patent Office

N77-30400 Wisconsin Univ., Madison.
TIME-DEPENDENT FIRST NORMAL STRESS DIFFERENCE AND SHEAR STRESS GENERATED BY POLYMER MELTS IN STEADY SHEAR FLOW Ph.D. Thesis
Ting-An Huang 1976 211 p
Avail: Univ. Microfilms Order No. 77-6611

The time-dependent primary normal stress difference and the shear stress for sudden starting and stopping of steady shear flow were measured. As in Meissner's study, the normal thrusts with various gap angles were also investigated on polyethylene. The thrust responses obtained with various gap angles are different except when the gap angle becomes large (6 deg to 10 deg). The effect of squeeze flow damping due to the cone and plate separation without cone rotation was estimated using linear viscoelasticity equations at constant volume with a memory function previously chosen (set B constants) to fit Meissner's elongation viscosity data. The system response equations with and without cone rotation were derived on the basis of a simplified mechanical model for the modified rheogoniometer. The calculated results agreed with measured cone displacements generated (without cone rotation) by an external load applied electromagnetically. Dissert. Abstr.

N77-30401 Virginia Polytechnic Inst. and State Univ., Blacksburg.
HYDRODYNAMIC STABILITY OF LIQUID FILMS ADJACENT TO INCOMPRESSIBLE GAS STREAMS INCLUDING EFFECTS OF INTERFACE MASS TRANSFER Ph.D. Thesis
Prakash Bhaskarrao Joshi 1976 226 p
Avail: Univ. Microfilms Order No. 77-10834

A theoretical study of linear stability of a gas/liquid interface with and without evaporation at the interface is presented. The zero mass transfer problem is solved for linear mean velocity profiles in both gas and liquid. The mass transfer problem is solved for small rates of evaporation, which allows the reduction of exponential mean profiles to linear profiles. The analysis considers instabilities in both gas and liquid motions and thus departs from the customary assumption of gas motion over a rigid wavy wall. The system of governing equations yields an eigenvalue problem upon employing the methods of stability theory. The results show that neglecting instabilities in the gas motion would predict a stable interface at moderate values of wave numbers when it is actually unstable. Mass transfer investigations are restricted to the modified Kelvin-Helmholtz mode and computations indicate that interface evaporation has a destabilizing effect at moderate wave numbers. Dissert. Abstr.

N77-30402 Princeton Univ., N. J.
THREE-DIMENSIONAL FLOW FIELDS GENERATED BY THE INTERACTION OF A SWEPT SHOCK WAVE WITH A TURBULENT BOUNDARY LAYER Ph.D. Thesis
Bastiaan Oskam 1976 249 p
Avail: Univ. Microfilms Order No. 77-9984

An investigation was carried out on the three-dimensional flow fields caused by the interaction of oblique shock waves and a two-dimensional turbulent boundary layer. The experimental

study was performed at a free stream Mach number of 2.94, a Reynolds number per inch of 1,600,000, ambient stagnation temperature and a near adiabatic wall temperature. The interaction was studied on two experimental configurations having different initial boundary layer thicknesses. Surface pressure measurements and oil flow patterns were obtained for both configurations with shock generator angles varying from 2 deg up to 14 deg. For the thick boundary layer heat transfer and skin friction (Preston tube) distributions were measured in the interaction region. Detailed flow field measurements of flow angularity, pitot pressure, static pressure and total temperature were conducted for shock generator angles of 4 deg and 10 deg. Dissert. Abstr.

N77-30403 Tennessee Univ., Knoxville.
RADIATIVE HEAT TRANSFER IN ARRAYS OF PARALLEL CYLINDERS Ph.D. Thesis
Richard Lee Cox 1976 226 p
Avail: Univ. Microfilms Order No. 77-10761

A theoretical and experimental study of radiative heat transfer in arrays of parallel cylinders is presented. Attention is primarily directed toward two geometries common in the nuclear industry: square arrays of cylinders on a square pitch and hexagonal arrays of cylinders on an equilibrium triangular pitch. Configuration factors for cylinders on square and eqilateral triangular pitches are derived using Hottel's crossed-string method. Theoretical equations are presented for configuration factors between rods up to four rows apart for cylinders on triangular spacings and between rods up to three rows apart for cylinders on square spacings. The usefulness of a formulation of the radiant energy exchange equations in terms of dimensionless variables is demonstrated for the case in which the heat generation rates of the cylinders are known and the temperatures are sought. Dissert. Abstr.

N77-30404 Pennsylvania State Univ., University Park.
INVESTIGATIONS OF THERMAL PLUMES ALONG VERTICAL WALLS Ph.D. Thesis
James Anthony Liburdy 1976 206 p
Avail: Univ. Microfilms Order No. 77-9695

This investigation considered the characteristics of two-dimensional thermal plumes rising along an upright, solid surface. Flows of this type are observed when heating elements are in a confined location, and also during unwanted fires. Two related flows were considered: a laminar thermal plume along an adiabatic surface, and a turbulent thermal plume along an isothermal wall. The laminar, adiabatic wall plume was studied theoretically. A boundary layer model was employed which provided for variable property effects. The solution was obtained through a similarity transformation, for a range of Prandtl numbers. The results suggest the need for altering current turbulence modeling methods in order to adequately treat this type of boundary layer flow. Dissert. Abstr.

N77-30405 Syracuse Univ., N. Y.
THE NEAR-FIELD FLOW OF AN AXISYMMETRIC JET IN A CROSS-STREAM Ph.D. Thesis
Zaher Milad Moussa 1976 257 p
Avail: Univ. Microfilms Order No. 77-9884

A flow field was established in a wind tunnel with uniform flow and low turbulence. Measurements of a three dimensional turbulent flow concerned only the case when there is no buoyancy or density stratification. The range of measurements included the flow upstream of the jet, the deflected jet and the wake of the cross stream produced downstream of the jet. Results show that there is considerable doubt that mathematical models of a jet in a cross stream based on some form of self-preservation relations will yield satisfactory results, at least in the development region from the jet origin until the flow reaches the state of the Beltrami flow. Also, the results proved that the entrainment process is an asymmetric phenomenon, and consequently models based on uniform and linear entrainment are questioned. Dissert. Abstr.

N77-30406 Tulane Univ., New Orleans, La.
A STUDY OF SUBMERGED AXISYMMETRIC JETS DISCHARGING INTO A DEAD-END VESSEL Ph.D. Thesis
Dilip K. Darooka 1976 220 p
Avail: Univ. Microfilms Order No. 77-10653

Amberlite resins were used as neutrally buoyant tracers in ethylene glycol and a mercury vapor lamp was used to provide a narrow plane of light illuminating the particles in a field containing the axis of symmetry. A light chopper was constructed which in addition to providing the dashed line traces for velocity measurement, attached a directional key to the traces. The test-section of the vessel is seen to contain various critical points (points of zero velocity) which determine the exact nature of the flow patterns. It is seen in all the composite figures that the location of the center of the vortex does not change significantly despite the considerable change in the size of the recirculating region. In a particular configuration in which the nozzle plate has been removed, the number of vortices in the test section is dependent on the Reynolds number. Presence of an unstable nodal point in the flow pattern indicates the existence of an azimuthal component of velocity in some configurations. Dissert. Abstr.

N77-30407*# Iowa Univ., Iowa City. Dept. of Physics and Astronomy.
A STATISTICAL FORMULATION OF ONE-DIMENSIONAL ELECTRON FLUID TURBULENCE
David Fyfe and David Montgomery Jun. 1977 54 p refs Submitted for publication
(Grant NGL-16-001-043; Contract E(11-1)-2059)
(NASA-CR-154285) Avail: NTIS HC A04/MF A01 CSCL 20D

A one-dimensional electron fluid model is investigated using the mathematical methods of modern fluid turbulence theory. Non-dissipative equilibrium canonical distributions are determined in a phase space whose co-ordinates are the real and imaginary parts of the Fourier coefficients for the field variables. Spectral densities are calculated, yielding a wavenumber electric field energy spectrum proportional to k to the negative second power for large wavenumbers. The equations of motion are numerically integrated and the resulting spectra are found to compare well with the theoretical predictions. Author

N77-30408*# Virginia Univ., Charlottesville. School of Engineering and Applied Science.
AN EXPERIMENTAL INVESTIGATION OF A THREE DIMENSIONAL WALL JET Ph.D. Thesis
George D. Catalano May 1977 214 p refs
(Grants NGR-47-005-219; NSF ENG-75-22488)
(NASA-CR-154288) Avail: NTIS HC A10/MF A01 CSCL 20D

One and two point statistical properties are measured in the flow fields of a coflowing turbulent jet. Two different confining surfaces (one flat, one with large curvature) are placed adjacent to the lip of the circular nozzle; and the resultant effects on the flow field are determined. The one point quantities measured include mean velocities, turbulent intensities, velocity and concentration autocorrelations and power spectral densities, and intermittencies. From the autocorrelation curves, the Taylor microscale and the integral length scale are calculated. Two point quantities measured include velocity and concentration space-time correlations and pressure velocity correlations. From the velocity space-time correlations, iso-correlation contours are constructed along with the lines of maximum maximorum. These lines allow a picture of the flow pattern to be determined. The pressures monitored in the pressure velocity correlations are measured both in the flow field and at the surface of the confining wall(s). Author

N77-30409*# Old Dominion Univ. Research Foundation, Norfolk, Va. School of Engineering.
INVESTIGATION OF AN INCOMPRESSIBLE FLOW ALONG A CORNER BY AN ALTERNATING DIRECTION IMPLICIT METHOD Final Report
G. L. Goglia and Dashrath K. Patel Aug. 1977 52 p refs
(Grant NsG-1311)
(NASA-CR-154648) Avail: NTIS HC A04/MF A01 CSCL 20D

The axial corner flow is analyzed for the incompressible laminar boundary layer flow. The governing equations are derived from the Navier-Stokes equations by neglecting second derivative terms of the axial direction. An alternating direction implicit method is used to solve the equations in primitive variables. Author

N77-30410*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
FAST METHODS INCORPORATING DIRECT ELLIPTIC SOLVERS FOR NONLINEAR APPLICATIONS IN FLUID DYNAMICS
E. Dale Martin Aug. 1977 19 p refs Presented at GAMM Workshop on Fast Solution Methods for the Discretized Poisson Equation, Karlsruhe, West Germany, 3-4 Mar. 1977
(NASA-TM-78426) Avail: NTIS HC A02/MF A01 CSCL 20D

Semidirect methods are discussed, their present role, as well as some developments for their application in computational fluid dynamics. A semidirect method is a computational scheme that uses a fast, direct, elliptic solver as the driving algorithm for the iterative solution of finite difference equations. Specific subtopics include: (1) direct Cauchy Riemann solvers for first order elliptic equations; (2) application of the semidirect method to the mixed elliptic hyperbolic problem of steady, inviscid transonic flow; and (3) the treatment of interior conditions, such as those on an airfoil or wing, in semidirect methods. Author

N77-30411# Flow Research, Inc., Kent, Wash.
NUMERICAL TURBULENCE Final Report, 1 Jul. 1974 - 30 Jun. 1975
Steven A. Orszag Jul. 1977 10 p refs
(Contract N00014-72-C-0355; NR Proj. 061-223)
(Rept-75) Avail: NTIS HC A02/MF A01

Bibliographies on numerical turbulence are evaluated and summerized. I.M.

N77-30412*# Rensselaer Polytechnic Inst., Troy, N. Y. Dept. of Chemical and Environmental Engineering.
THE EFFECT OF THE LIQUID-SOLID SYSTEM PROPERTIES ON THE INTERLINE HEAT TRANSFER COEFFICIENT
P. C. Wayner, Jr. Aug. 1977 45 p refs
(NASA Order A-38597-B)
(NASA-CR-152013) Avail: NTIS HC A03/MF A01 CSCL 20D

A theoretical procedure to determine the heat transfer characteristics of the interline region of an evaporating meniscus using the macroscopic optical and thermophysical properties of the system is outlined. The analysis is based on the premise that the interline transport processes are controlled by the London-van der Waals forces between condensed phases (solid and liquid). The procedure is used to compare the relative size of the interline heat sink of various systems using a constant heat flux model. This solution demonstrates the importance of the interline heat flow number which is evaluated for various systems. The heat transfer characteristics of the decane-steel system are numerically compared with those of the carbon tetrachloride-quartz system. Author

N77-30413*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
LIQUID JET IMPINGEMENT NORMAL TO A DISK IN ZERO GRAVITY Ph.D. Thesis Toledo Univ.
Thomas L. Labus Aug. 1977 118 p refs
(NASA-TP-1017; E-8668) Avail: NTIS HC A06/MF A01 CSCL 20D

The free surface shapes of circular liquid jets impinging normal to sharp-edged disks in zero gravity are determined. Zero gravity drop tower experiments yielded three distinct flow patterns that were classified in terms of the relative effects of surface tension and inertial forces. An order of magnitude analysis was conducted that indicated regions where viscous forces were not significant in the computation of free surface shapes. The free surface analysis was simplified by transforming the governing potential flow equations and boundary conditions into the inverse plane, where the stream function and velocity potential became the coordinates. The resulting nonlinear equations were solved by standard finite difference methods, and comparisons were made with the experimental data for the inertia dominated regime. Author

N77-30414# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Cologne (West Germany).
INVESTIGATION OF THE THREE-DIMENSIONAL FLOW IN A DUCT QUADRANGULAR, VARIABLE CROSS SECTION BY MEANS OF THE PANEL METHOD
Juergen Renken 18 Jun. 1975 54 p refs In GERMAN; ENGLISH summary Translation was announced as N76-27528
(DLR-FB-75-46) Avail: NTIS HC A04/MF A01; DFVLR, Cologne DM 21.50

The applicability of the panel method for calculating the three-dimensional flow in ducts with quadrangular, variable cross section is investigated. The theoretical results are compared with qualitative data obtained in an equivalent water flow. Author

N77-30415*# Dynatherm Corp., Cockeysville, Md.
DEVELOPMENT OF A JET PUMP-ASSISTED ARTERIAL HEAT PIPE Final Report
Walter B. Bienert, Amon S. Ducao, and Donald S. Trimmer 6 May 1977 55 p refs
(Contract NAS2-9233)
(NASA-CR-152015; DTM-77-2) Avail: NTIS HC A04/MF A01 CSCL 20D

The development of a jet pump assisted arterial heat pipe is described. The concept utilizes a built-in capillary driven jet pump to remove vapor and gas from the artery and to prime it. The continuous pumping action also prevents depriming during operation of the heat pipe. The concept is applicable to fixed conductance and gas loaded variable conductance heat pipes. A theoretical model for the jet pump assisted arterial heat pipe is presented. The model was used to design a prototype for laboratory demonstration. The 1.2 m long heat pipe was designed to transport 500 watts and to prime at an adverse elevation of up to 1.3 cm. The test results were in good agreement with the theoretical predictions. The heat pipe carried as much as 540 watts and was able to prime up to 1.9 cm. Introduction of a considerable amount of noncondensible gas had no adverse effect on the priming capability. Author

N77-30416*# Old Dominion Univ. Research Foundation, Norfolk, Va.
SIMULATION OF TURBULENT WALL PRESSURE Final Report
Robert L. Ash Sep. 1977 44 p refs
(Grant NsG-1100)
(NASA-CR-154872) Avail: NTIS HC A03/MF A01 CSCL 20D

A Monte Carlo procedure has been developed to simulate turbulent boundary layer wall pressure fluctuations. The approach utilizes much of the newly available conditional sampling information to construct the required distribution functions. Various disturbance wave forms have been examined, as well as the effect of frequency-dependent decay. Good agreement between the simulation and experimental data has been achieved for root mean square pressure level, power spectrum, and space-time correlation. Author

N77-30417# Pennsylvania Transportation Inst., University Park. Applied Research Lab.
PRESKEW: PRELIMINARY SKEW ANALYSIS PROGRAM
A. L. Treaster 9 Mar. 1977 35 p refs
(Contract N00017-73-C-1418)
(AD-A039052; TM-77-62) Avail: NTIS HC A03/MF A01 CSCL 09/2

Presented in this memorandum are the theoretical modifications to the radial equilibrium equation and the computerized adaptations required to approximate the effects of skewed blading in the current working version of the streamline curvature method computer program (SCM-IV). The procedure is illustrated by the analysis of a pumpjet that is fitted with a skewed rotor. The results of this analysis which utilizes the data generated by PRESKEW show an improved agreement with experimental data relative to SCM-IV calculations prior to the skew modification. Author (GRA)

N77-30418# Naval Postgraduate School, Monterey, Calif.
NUCLEATE BOILING OF FREON 113 IN THIN LIQUID FILMS M.S. Thesis
Soehana Dec. 1976 84 p refs
(AD-A039339) Avail: NTIS HC A05/MF A01 CSCL 20/13

Experimental results are presented for distilled Freon 113 at atmospheric pressure with liquid levels ranging from pool depths near 10mm down to thin films near 0.2mm. Temperature measurements with thermocouples and liquid crystals show that liquid level has little effect on heat transfer coefficient above a

level of 5mm, and a slight decrease occurs as the liquid level is reduced to 2mm. Below 2mm, the heat transfer coefficient increases sharply as the level is further reduced. In addition, the heat transfer coefficient increases with increased surface roughness. In thin films, the incipient boiling point occurs at a lower heat flux and a lower superheat than in pool boiling.
Author (GRA)

N77-30419# Naval Postgraduate School, Monterey, Calif.
GRAVITATIONAL EFFECTS ON THE OPERATION OF A VARIABLE CONDUCTIVE HEAT PIPE M.S. Thesis
Robert Scott Owendoff Mar. 1977 74 p refs
(AD-A039354) Avail: NTIS HC A04/MF A01 CSCL 20/13

A variable conductance heat pipe, measuring 2.5 centimeters in diameter and 152 centimeters in length, was built. The heat pipe was operated in both the conventional and variable conductance modes to obtain experimental data concerning performance characteristics. The input electrical power was varied from 20 to 50 watts with the heat pipe placed in both the horizontal and vertical positions. Methanol and Freon 113 were selected as the working fluids; helium and krypton were the non-condensible gases. In the variable conductance mode, liquid crystals were used to observe qualitatively the temperature gradients occurring across the vapor-gas interface. Summarized performance data for the various operating conditions and graphs of the isotherms obtained from the liquid crystal data are presented. Author (GRA)

N77-30420# Dynell Electronics Corp., Melville, N.Y.
WAVE MOTION IN A THICK-WALLED FLUID-FILLED HOSE Final Report, 1 Jan. 1975 - 30 Apr. 1977
Oscar A. Lindermann Apr. 1977 15 p
(Contract N00014-75-C-0633)
(AD-A039528; DY-764R) Avail: NTIS HC A02/MF A01 CSCL 20/14

The subject of this report is the analytical solution for wave motions, in the fundamental mode, of an elastic tube filled with fluid when the wall thickness is not constrained to be small. The results obtained show the existence of two waves which travel at different speeds. Each of the two waves causes both longitudinal and radial displacements of both the tube wall and the fluid, but in different proportions. The slower wave, in the limiting case of the thin-walled tube, is identified as the bulge wave. It is characterized by relatively large motions of the fluid, which contains most of the kinetic energy. Thicker walls produce a higher bulge-wave speed, but the inclusion of longitudinal stiffening elements has very little effect. The faster wave is what has been called the wall wave. This is mostly a longitudinal vibration of the hose material, with a relatively small participation by the fluid, and is greatly influenced by longitudnal reinforcement of the tube wall. Author (GRA)

N77-30421# Analytical Methods, Inc., Bellevue, Wash.
INVESTIGATIONS OF THREE-DIMENSIONAL FLOW SEPARATION ON FUSELAGE CONFIGURATIONS Final Report, May 1975 - May 1976
Frank A. Dvorak, Brian Maskew, and Frank A. Woodward Mar. 1977 96 p refs
(Contract DAAJ02-75-C-0036)
(AD-A039382; USAAMRDL-TR-77-4) Avail: NTIS HC A05/MF A01 CSCL 20/4

A method is described for calculating the complete pressure distribution on a body with separated flow. The boundary layer characteristics are calculated along several streamlines up to the point where separation is predicted. The separated flow is modeled by streamwise panels of uniform vorticity attached to the body near the predicted separation line. Comparisons are presented of calculated and experimental pressure distributions for a cylinder, a sphere and the BO105 fuselage. The results are in fair agreement, but there are certain features of the results and restrictions of the source/vortex inviscid model which need improvement. Author (GRA)

N77-30422# Textron Bell Aerospace Co., Buffalo, N. Y.
NUMERICAL SOLUTION OF COMPLETE FLOWS AROUND EXTERNAL STORES Final Report, Aug. 1974 - Dec. 1976
Z. Popinski, W. L. Rushmore, and S. W. Zelazny Dec. 1976 73 p refs
(Contract F4460-75-C-0003)
(AD-A039213; Rept-9236-927001; AFOSR-77-0621TR) Avail: NTIS HC A04/MF A01 CSCL 20/4

A computer code, based on a finite element algorithm, was developed to solve the governing equations for a three-dimensional flow around a spherically blunted cone at an angle of attack. The solution is valid for a boundary layer region, including the flow separation in the cross-flow direction in the leeward area. The required initial and boundary conditions for this solution are obtained from a finite difference computer program for laminar compressible three-dimensional boundary layer flow. Extension of the analysis to include the turbulent transport using the mixing length theory and a two-equation turbulence model is described. The results demonstrate the capability of the finite element method to predict the three-dimensional boundary region flow with cross-flow separation in the leeward area and to model the effects of turbulent flow. Author (GRA)

N77-30423# California Inst. of Tech., Pasadena. Div. of Engineering and Applied Science.
NON-UNIFORM FLOW IN MULTISTAGE AXIAL COMPRESSORS Final Report, 1 Mar. 1975 - 30 Nov. 1976
Frank E. Marble Mar. 1977 40 p refs
(Grant AF-AFOSR-2819-75)
(AD-A039133; AFOSR-77-0630TR) Avail: NTIS HC A03/MF A01 CSCL 20/4

This paper examines a specific example of distorted inlet flow through the two-dimensional annulus of a multistage compressor which can be solved completely. It is shown that the essential features of this exact solution, including stall, may be described by a two-parameter family of profiles and that an integral technique, utilizing these elementary profiles, will yield essentially the same results. While it is not clear that comparable success would hold for the three-diminsional problem, the results confirm the contention that the two-dimensional problem may be treated with acceptable accuracy by an integral technique. GRA

N77-30424# Detroit Diesel Allison, Indianapolis, Ind. Diesel Allison Div.
RESEARCH ON AEROELASTIC PHENOMENA IN AIRFOIL CASCADES. AN EXPERIMENTAL INVESTIGATION OF THE UNSTEADY AERODYNAMICS OF A CONTROLLED OSCILLATING MCA AIRFOIL CASCADE
Sanford Fleeter and Ronald E. Riffel Dec. 1976 79 p refs
(Contract N00014-72-C-0351)
(AD-A039550; DDA-EDR-9028) Avail: NTIS HC A05/MF A01 CSCL 20/4

A unique unsteady cascade experiment directed at providing fundamental aerodynamic data needed to verify or direct refinements to the basic model on unstalled supersonic torsional flutter in turbomachines is presented. In particular, the steady, quasi-static, and unsteady aerodynamics were determined for a multiple circular arc (MCA) airfoil cascade which modeled the tip section of an advanced design fan blade. The MCA cascade was harmonically oscillated in the torsional mode at a reduced frequency value of 0.14. The fundamental unsteady aerodynamic data was obtained at a Mach number equal to 1.55 over a range of interblade phase angles for two values of the cascade static pressure ratio. These unsteady results were then correlated with the predictions from state-of-the-art unsteady flat plate cascade analyses. GRA

N77-30425# Naval Postgraduate School, Monterey, Calif.
DETERMINATION OF THE BLADE-ELEMENT PERFORMANCE OF A SMALL TRANSONIC ROTOR M.S. Thesis
Wayne Randolph Hawkins Dec. 1976 114 p refs
(AD-A039320) Avail: NTIS HC A06/MF A01 CSCL 13/7

The blade-element performance of a small transonic compressor rotor operating at high subsonic speeds is reported. Measurements were made downstream using a small calibrated pneumatic probe, with simultaneous measurements of total pressure, velocity, turning angle, and temperature. In addition, a program is presented to calculate blade-element performance based on empirical data contained in NASA SP-36.
Author (GRA)

N77-30426# Virginia State Coll., Petersburg. Dept. of Mathematics.

NON-LINEAR EFFECTS OF TRANSVERSE GRAVITY FIELD IN CAVITY FLOW

Krishnan M. Grawal and Sheau-Yen Cheng Jun. 1977 30 p refs

(Contract N00014-75-C-0679)

(AD-A039780; Rept-77-1-ONR; TR-2) Avail: NTIS HC A03/MF A01 CSCL 20/4

A non-linear analysis has been made to determine the effects of the transverse gravity field on steady cavity flow past a symmetric wedge. Tulin's single-spiral cavity model is used to represent the flow and conformal mapping, and the Riemann-Hilbert technique has been employed to obtain the numerical solution. The present theory shows that the cavity length for the gravity solution is smaller and lies entirely within the gravity-free case. Also, the charge in the drag coefficient from the non-gravity case to the gravity case is small. Author (GRA)

N77-30427# New York Univ., N. Y. Inst. of Mathematical Sciences.

THE ARTIFICIAL COMPRESSION METHOD FOR COMPUTATION OF SHOCKS AND CONTACT DISCONTINUITIES. 3: SELF-ADJUSTING HYBRID SCHEMES

Amiram Harten Mar. 1977 56 p refs

(Contract F44620-74-C-0062)

(AD-A040141; IMM-415; AFOSR-77-0659TR) Avail: NTIS HC A04/MF A01 CSCL 12/1

This paper presents a new computational method for the calculation of discontinuous solutions of hyperbolic systems of conservation laws, and in particular contact discontinuities. The method consists of two stages; in the first stage a standard finite difference scheme is hybridized with a nonoscillatory first order method to allow a monotonic transition of discontinuities; in the second stage artificial compression is applied to sharpen transitions of discontinuities. This modification of a standard finite difference method results in a scheme which preserves the order of truncation error of the original method and yet yields a sharp and oscillation free transition of both shocks and contact discontinuities. The modification can be easily implemeted in existing computer codes. Author (GRA)

N77-30428# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).

EFFECT OF FREE STREAM TURBULENCE ON TURBULENT BOUNDARY LAYERS IN INCOMPRESSIBLE FLOW Ph.D. Thesis - Toulouse Univ., May 1976

Daniel Arnal Feb. 1977 100 p refs In FRENCH; ENGLISH summary Report will also be announced as translation (ESA-TT-411)

(ONERA-NT-1977-1) Avail: NTIS HC A05/MF A01

The influence of a free-stream turbulence on a turbulent boundary layer subjected to a positive pressure gradient was studied. A high level of turbulence was generated by a grid of rods. Measurements of the mean velocity and of the fluctuations in the boundary layer are presented. The longitudinal velocity fluctuation is characterized by its mean quadratic value and by its spectrum. The influence of the free-stream turbulence seems to be restricted to the external region of the boundary layer. The most important effects are obtained around the separation point. Calculations of the boundary layer by means of a set of transport equations are compared with the present experiments and other available data. An integral method is also proposed, in which an adapted mixing length scheme is used. Both calculation methods give a good level of agreement with experiments. Author (ESA)

N77-30429# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).

TWO-DIMENSIONAL MODEL FOR THE FORMATION OF VORTEX SHEETS SHED BY THE LATERAL EDGE OF A WING Ph.D. Thesis - Paris 6 Univ.

Philippe Joncheray Apr. 1977 67 p refs In FRENCH; ENGLISH summary Report will also be announced as translation (ESA-TT-413)

(ONERA-NT-1977-5) Avail: NTIS HC A04/MF A01

The formation of the vortex sheet shed by the lateral edge of a thin wing, at low angle of attack, set in motion by an impulse in an incompressible viscous fluid, was studied by an unsteady two-dimensional model. It is shown, by an asymptotic analysis of the three-dimensional flow, that the Navier-Stokes equations in a vicinity of the lateral edge are divided into a system that governs the two-dimensional flow in the plane normal to the wing, and a scalar equation for the longitudinal velocity component, and that as long as a specific condition is fulfilled. Moreover, for a wing with parabolic section, a study in order of magnitude of the terms intervening in the equations of the two-dimensional model of passing round this edge leads to a validity condition of this model to describe the sheet formation. Two numerical methods were compared for the solution of this problem: the first makes use of the Dufort-Frankel scheme for the vortex calculation and an overrelaxation method for the stream function, the second is derived from the integro-differential method of Wu and Thompson: computation of the velocity by an integral formula and utilization of the same scheme for the vortex calculation. The first method being much faster than the second, it was used for calculations for Reynolds numbers 100, 500, and 1000. For the first two, the calculation stopped after reaching an important separation. For R = 1000, the calculation was pursued up to the appearance of a vortex sheet. The flow is visualized by streamlines and iso-vortex lines. The trajectories of some particles were traced, which display a helix shape characteristic of the unsteady aspect of the phenomenon. Author (ESA)

N77-30430# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).

PREDICTION OF ONSET AND DEVELOPMENT OF BOUNDARY LAYER TRANSITION

Roger Michel Apr. 1977 23 p refs In FRENCH; ENGLISH summary Presented at the Assoc. Aeron. et Astronautique de France 13th Colloq. d'Aerodyn. Appl., Lyon, 8-10 Nov. 1976 Report will also be announced as translation (ESA-TT-414)

(ONERA-NT-1977-6) Avail: NTIS HC A02/MF A01

The existing prediction means of the onset of the boundary layer transition was analyzed as well as its development up to the established turbulent regime, in the field of incompressible or moderately compressible flows. A review of the practical prediction techniques is given together with a discussion of the available empirical criteria and of approximate methods for calculating the boundary layer, starting from a given beginning of transition. Special attention is paid to recent methods of prediction, using transport equations for describing the development of the turbulence in the boundary layer during transition. It is shown by different examples of application that this is a technique which makes it possible to give a reasonable prediction of the onset and development of transition, in good agreement with experiments. Author (ESA)

N77-30431# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Goettingen (West Germany). Inst. fuer Aeroelastik.

ANALYTICAL SOLUTION OF THE GENERALIZED HELMHOLTZ WAVE EQUATION FOR COMPRESSIBLE SUBSONIC FLOW AND CALCULATION OF THE UNSTEADY PRESSURE DISTRIBUTION ABOUT OSCILLATING SPHEROIDS

Kuang-Lai Chao 28 Mar. 1977 36 p refs In GERMAN; ENGLISH summary Report will also be announced as translation (ESA-TT-421)

(DLR-FB-77-11) Avail: NTIS HC A03/MF A01; DFVLR, Cologne DM 18.90

Analytical solutions for inviscid compressible subsonic flow are derived within the framework of linear unsteady aerodynamics. The method of separation of variables is used to solve the generalized Helmholtz wave equation analytically. The solutions are obtained in a non-orthogonal spheroidal coordinate system. The unsteady pressure distributions on oscillating spheroids are calculated using the spheroidal wave functions. Author (ESA)

N77-30432# Naval Postgraduate School, Monterey, Calif.

TIME INTEGRATION OF UNSTEADY TRANSONIC FLOW TO A STEADY STATE SOLUTION BY THE FINITE ELEMENT METHOD M.S. Thesis

Raymond John Nichols, Jr. Mar. 1977 109 p refs

(AD-A039790) Avail: NTIS HC A06/MF A01 CSCL 20/4

A finite element method was applied to the unsteady transonic

small disturbance equation and integrated until the solution converged to the steady state for a thin nonlifting airfoil. The method of weighted residuals was used to formulate the finite element equations and Houbolt's method of central differencing in time was used to integrate these equations. A secondary investigation applied the steady transonic small disturbance equations to a converging-diverging nozzle. Author (GRA)

N77-30433# Naval Ship Research and Development Center, Bethesda, Md. Ship Performance Dept.
USER'S MANUAL FOR A FORTRAN 4 COMPUTER PROGRAM FOR CALCULATING THE POTENTIAL FLOW/ BOUNDARY LAYER INTERACTION ON AXISYMMETRIC BODIES Final Report
H. T. Wang and T. T. Huang Dec. 1976 50 p refs
(AD-A036450; SPD-737-01) Avail: NTIS HC A03/MF A01 CSCL 20/4

A description is given of a computer program which calculates the incompressible boundary layer flow and pressure distribution over an axisymmetric body. A brief outline is given of the computation method. Detailed input instructions are provided. A sample problem is solved to illustrate usage of the program and also to present the output. The general output scheme is explained and the output variables are defined. Author (GRA)

N77-30434# Council for Scientific and Industrial Research, Pretoria (South Africa). Chemical Engineering Research Group.
PRESSURE DROP IN AIR FLOW ACROSS BANKS OF FIN TUBES WITH VARYING TUBE PITCH AND FIN SPACING
R. DeBruyn Mar. 1976 22 p refs
(PB-267660/9; CSIR-CENG-119; ISBN-0-7988-0894-2) Avail: NTIS HC A02/MF A01 CSCL 13A

The importance of considering tube-fin spacing and height in the prediction of air pressure drop in heat exchangers is discussed. Pressure gradients were determined for six tube banks, each with a different pitch and wider spacing than used in previous investigations. Data obtained were used to generate a new correlation for the friction factor. GRA

35 INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.

For aerial photography see *43 Earth Resources*. For related information see also *06 Aircraft Instrumentation*, and *19 Spacecraft Instrumentation*.

N77-30435 Georgia Inst. of Tech., Atlanta.
DYNAMIC THEORY OF VOLUME HOLOGRAPHIC RECORDING AND READOUT IN ELECTRO-OPTIC CRYSTALS Ph.D. Thesis
Robert Magnusson 1976 192 p
Avail: Univ. Microfilms Order No. 77-7771

The dynamic theory of volume holography was found to qualitatively and, to some extent, quantitatively describe all aspects of experimentally observed thick (phase) hologram terminal (output) characteristics measured in electro-optic crystals such as LiNbO3. The description of the formation (recording), static readout (angular selectivity), and dynamic readout of the hologram are all contained in the dynamic theory formalism. The experimentally observed erasure-enhancement effect during dynamic readout is predicted by the theory with correct initial slopes. Angular selectivity patterns predicted may be asymmetric with the maximum diffraction efficiency occurring off the Bragg angle. It is concluded that the dynamic theory is the most comprehensive thick hologram theory presently in existence. Finally, as a separate topic, the discovery of laser scattering induced holograms in lithium niobate is reported. Dissert. Abstr.

N77-30436* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
TACHOMETER Patent
Frank J. Nola, inventor (to NASA) Issued 2 Aug. 1977 5 p Filed 18 Mar. 1976 Supersedes N76-19409 (14 - 10, p 1253)
(NASA-Case-MFS-23175-1; US-Patent-4,039-946; US-Patent-Appl-SN-667928; US-Patent-Class-324-165; US-Patent-Class-324-163; US-Patent-Class-340-347SY; US-Patent-Class-340-347P; US-Patent-Class-340-271; US-Patent-Class-324-174) Avail: US Patent Office CSCL 14B

A tachometer in which sine and cosine signals responsive to the angular position of a shaft as it rotates are each multiplied by like, sine or cosine, functions of a carrier signal, the products summed, and the resulting frequency signal converted to fixed height, fixed width pulses of a like frequency. These pulses are then integrated, and the resulting dc output is an indication of shaft speed. Official Gazette of the U.S. Patent Office

N77-30437 Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
THE THEORY OF DIFFRACTION FROM A HOLOGRAPHIC LENS Ph.D. Thesis
Daniel David Young 1976 210 p
Avail: Univ. Microfilms Order No. 77-9478

The analysis was based upon a pair of coupled wave equations with variable coefficients of sufficient generality to permit the determination of the diffraction efficiency in cases where previous theories have been limited. These cases include: (1) spherical object, reference, and reconstruction waves, (2) polarized reconstruction waves, (3) reconstruction wave vectors out of the plane of incidence of the construction wave vectors, (4) thickness changes of the hologram recording material due to processing, (5) gross changes in optical index due to processing, (6) variations with position inside the hologram of the hologram parameters such as optical index and index modulation, (7) saturation of the index and absorptance modulation with exposure, and (8) absorption during exposure of the construction waves. It was concluded that the application of the JWKB approximation to obtain a solution of the equations which describe the diffraction of light by a holographic lens was successful. Dissert. Abstr.

N77-30438 Ohio State Univ., Columbus.
RAPID SCANNING SPECTROMETER: DESIGN, COMPUTERIZATION, AND APPLICATIONS Ph.D. Thesis
Dennis A. Yates 1976 341 p
Avail: Univ. Microfilms Order No. 77-10630

A galvanometer (RSS) rapid scanning spectrometer was constructed with reflecting optics. Resolution was measured to be .5 nm according to the Rayleigh criterion. The sensitivity was found to be critically dependent on source (Xenon arc) alignment. The low frequency noise was .005 A and the high frequency noise was .04 A. The RSS had an electron band pass of 200 KHz. Factors (scan linearity, photomultiplier tube response, optical aberrations, etc.) which affect RSS performance are discussed. A real-time computer system was developed for use with the RSS as well as other experiments normally undertaken in the laboratory. An 8 channel analog-to-digital convertor interface and a 48 bit out/32 bit in digital input/output interface are described as well as FORTRAN callable assembly language drivers. The computer system was used to automate an experiment involving the indirect coulometric titration of bio-components. The automation approach is discussed. Dissert. Abstr.

N77-30439 Pennsylvania Univ., Philadelphia.
MICROWAVE HOLOGRAPHIC IMAGING OF AIRCRAFT WITH SPACEBORNE ILLUMINATING SOURCE Ph.D. Thesis
Tomislav Angel Dzekov 1976 274 p
Avail: Univ. Microfilms Order No. 77-10158

The conceptual development of a method for providing high angular resolution and accurate angular position estimates for surveillance and traffic control of aircraft is reviewed. The method is based on the use of a large random array of conformally located receiving elements and a CW microwave source located on a geostationary satellite. In the vicinity of the earth's surface and above the array a roughly cylindrical volume of several hundred kilometers in diameter is illuminated. The interference pattern of the direct signal from the satellite and the signals reflected from aircraft in the illuminated volume is sampled by the array

elements at discrete locations and then interrogated digitally to obtain useful target date. Dissert. Abstr.

N77-30440*# Montevallo Research Associates, Ala.
MSFC HOLOGRAPHIC CORRELATION TECHNIQUES FACILITY STUDY Final Report
J. William Foreman, Jr. and Joseph M. Cardone Jun. 1977 72 p refs
(Contract NAS8-32362)
(NASA-CR-150371) Avail: NTIS HC A04/MF A01 CSCL 14B

The basic theory of the holographic correlation system is illustrated. The effect of translating the object distribution in the object plane when the hologram is illuminated is investigated. The effect of translating the object along the optical axis is discussed and preliminary results presented. A.R.H.

N77-30441*# Applied Science Associates, Inc., Apex, N.C.
BACKSCATTERING FROM A GAUSSIAN DISTRIBUTED, PERFECTLY CONDUCTING, ROUGH SURFACE Technical Report, 20 Jan. 1976 - 20 Jan. 1977
G. S. Brown Aug. 1977 47 p refs
(Contract NAS6-2420)
(NASA-CR-141424) Avail: NTIS HC A03/MF A01 CSCL 20N

The problem of scattering by random surfaces possessing many scales of roughness is analyzed. The approach is applicable to bistatic scattering from dielectric surfaces, however, this specific analysis is restricted to backscattering from a perfectly conducting surface in order to more clearly illustrate the method. The surface is assumed to be Gaussian distributed so that the surface height can be split into large and small scale components, relative to the electromagnetic wavelength. A first order perturbation approach is employed wherein the scattering solution for the large scale structure is perturbed by the small scale diffraction effects. The scattering from the large scale structure is treated via geometrical optics techniques. The effect of the large scale surface structure is shown to be equivalent to a convolution in k-space of the height spectrum with the following: the shadowing function, a polarization and surface slope dependent function, and a Gaussian factor resulting from the unperturbed geometrical optics solution. This solution provides a continuous transition between the near normal incidence geometrical optics and wide angle Bragg scattering results. Author

N77-30442*# Applied Science Associates, Inc., Apex, N.C.
MICROWAVE BACKSCATTERING THEORY AND ACTIVE REMOTE SENSING OF THE OCEAN SURFACE Final Report, 20 Jan. 1976 - 20 Jan. 1977
G. S. Brown and L. S. Miller Aug. 1977 38 p refs
(Contract NAS6-2520)
(NASA-CR-141423) Avail: NTIS HC A03/MF A01 CSCL 08J

The status is reviewed of electromagnetic scattering theory relative to the interpretation of microwave remote sensing data acquired from spaceborne platforms over the ocean surface. Particular emphasis is given to the assumptions which are either implicit or explicit in the theory. The multiple scale scattering theory developed during this investigation is extended to non-Gaussian surface statistics. It is shown that the important statistic for the case is the probability density function of the small scale heights conditioned on the large scale slopes; this dependence may explain the anisotropic scattering measurements recently obtained with the AAFE Radscat. It is noted that present surface measurements are inadequate to verify or reject the existing scattering theories. Surface measurements are recommended for qualifying sensor data from radar altimeters and scatterometers. Additional scattering investigations are suggested for imaging type radars employing synthetically generated apertures. Author

N77-30443*# Applied Science Associates, Inc., Apex, N.C.
INITIAL DEVELOPMENT OF A METHOD OF SIGNIFICANT WAVEHEIGHT ESTIMATION FOR GEOS-III
G. S. Hayne Aug. 1977 13 p refs
(Contract NAS6-2520)
(NASA-CR-141425) Avail: NTIS HC A02/MF A01 CSCL 08C

The numerical method by which ocean surface significant waveheight estimates are produced from the GEOS-3 radar altimeter data is described. Four parameters characterizing the expected radar mean return waveform are determined from the altimeter's sixteen sample-and-hold waveform samplers through use of an iterative, least squares approach. One of the four parameters is a risetime term which has contributions from both the transmitted radar pulse width and the rms ocean surface height; the estimated significant waveheight is extracted from this risetime. The noise character of the estimation process leads to occasional negative significant waveheight estimates, and the origin of these nonphysical negative results is discussed. Possible modifications and areas for additional investigation are indicated. Author

N77-30444*# Old Dominion Univ. Research Foundation, Norfolk, Va.
SENSOR FOR MEASURING INSTANTANEOUS ANGLE OF ATTACK OF HELICOPTER BLADES Progress Report, Jul. 1976 - Jul. 1977
P. Stephen Barna and Henry W. Liu Aug. 1977 47 p
(Grant NsG-1143)
(NASA-CR-154808) Avail: NTIS HC A03/MF A01 CSCL 14B

Various research activities are reported in the following areas: (1) improving and testing probes; (2) theoretical studies of probe motion; and (3) improving research facilities. It is concluded that a satisfactory solution to the problem of measuring angle of attack of helicopter blades may be found in the near future. Author

N77-30445*# Massachusetts Inst. of Tech., Cambridge. Center for Materials Science and Engineering.
A CHROMATOGRAPHIC ANALYSIS OF THE RESPONSE OF POLYMERIC FIRE-DETECTION DEVICES TO COMBUSTION PRODUCTS Final Report, 1 May 1975 - 28 Feb. 1977
Stephen D. Senturia May 1977 36 p refs
(Grant NsG-3061)
(NASA-CR-154845) Avail: NTIS HC A03/MF A01 CSCL 14B

Polymer responses to a variety of smouldering sources, including cellulose, acrylic, urethane, polyvinyl chloride, and wool were investigated. A suitable trapping system for combustion products was developed and a charge flow transistor was fabricated to monitor the transverse or sheet resistance of a thin film. A.R.H.

N77-30446*# Lockheed Electronics Co., Houston, Tex. Systems and Services Div.
A MODEL OF THE 1.6 GHz SCATTEROMETER
J. R. Wang Jul. 1977 143 p refs
(Contract NAS9-15200)
(NASA-CR-151505; LEC-10521; JSC-12990) Avail: NTIS HC A07/MF A01 CSCL 14B

The performance was studied of the 1.6 GHz airborne scatterometer system which is used as one of several Johnson Space Center (JSC) microwave remote sensors to detect moisture content of soil. The system is analyzed with respect to its antenna pattern and coupling, the signal flow in the receiver data channels, and the errors in the signal outputs. The operational principle and the sensitivity of the system, as well as data handling are also described. The finite cross-polarized gains of all four 1.6 GHz scatterometer antennae are found to have profound influence on the cross-polarized backscattered signal returns. If these signals are not analyzed properly, large errors could result in the estimate of the cross-polarized coefficient. It is also found necessary to make corrections to the variations of the aircraft parameters during data reduction in order to minimize the error in the coefficient estimate. Finally, a few recommendations are made to improve the overall performance of the scatterometer system. Author

N77-30447*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
VISIBLE AND INFRARED IMAGING RADIOMETERS FOR OCEAN OBSERVATIONS
W. L. Barnes Jul. 1977 44 p refs Presented at AGARD

Lecture Series No. 88, Oslo, Norway, 2-11 Oct. 1977
(NASA-TM-X-71374; X-941-77-168) Avail: NTIS HC A03/MF A01 CSCL 14B

The current status of visible and infrared sensors designed for the remote monitoring of the oceans is reviewed. Emphasis is placed on multichannel scanning radiometers that are either operational or under development. Present design practices and parameter constraints are discussed. Airborne sensor systems examined include the ocean color scanner and the ocean temperature scanner. The costal zone color scanner and advanced very high resolution radiometer are reviewed with emphasis on design specifications. Recent technological advances and their impact on sensor design are examined. Author

N77-30448# TRW Systems Group, Redondo Beach, Calif.
MONTE CARLO SIMULATION OF ION COLLECTION BY A ROCKET-BORNE MASS SPECTROMETER Final Report, Jan. 1974 - Dec. 1976
Takashi Sugimura Jan. 1977 64 p refs
(Contract F19628-74-C-0128)
(AD-A039945; AFGL-TR-77-0027) Avail: NTIS HC A04/MF A01 CSCL 20/8

A systematic parametric variation for the positive ion collection by a rocket-borne probe has been completed for the following parameters; speed ratio 3.10, non-dimensional front face potential -200, zero sidewall potential, Debye numbers from 0.01 to 1000, and Knudsen numbers from 0.007 to 1000. The effects of finite space charge on the vehicle are to lower the ion flux to the stagnation point. It is found that the ion flux follows a uniform trend for Knudsen numbers greater than 0.2, but becomes complicated for the near-continuum regime, e.g., Knudsen number equal to 0.007, which is discussed in detail. Investigation of vehicle angle of attack and internal degrees of freedom indicate that the effects on the ion flux are small. The formulation for the collection negative ions has been completed and preliminary results indicate that the electrons are described properly.
Author (GRA)

N77-30449# Defence Research Establishment Pacific, Victoria (British Columbia).
A HIGH-RATE DIGITAL DATA RECORDING APPLICATION OF THE BELL AND HOWELL VR-3700B TAPE RECORDER
M. R. Black and K. A. Ashcroft Aug. 1976 43 p
(AD-A039275; DREP-TM-76-11) Avail: NTIS HC A03/MF A01 CSCL 14/3

A tape recording system was assembled to record scientific data on board a research vessel. Digital data equivalent to a single serial bit stream with a clock rate of 10.6 mHz were multiplexed onto six serial pulse-code-modulation channels of a Bell and Howell VR-3700B high-density digital tape recording system. The Bell and Howell enhanced-non-return-to-zero (ENRZ) code was used with a tape speed of 120 inches per second and a packing density of 16,500 bits per inch. Auxiliary data including compass reading, time, ship's speed, event count, trial number, and analog amplifier gain were recorded on a seventh digital channel of the tape recorder. An interface system between the data source and the tape recorder was developed for handling and formatting both recorded and reproduced data. Facility was provided to allow playback of recorded data at one thirty-second times real time for detailed analysis. GRA

N77-30450# Grumman Aerospace Corp., Bethpage, N.Y. Research Dept.
BASELINE TEST OF A MATCHED FILTER CORRELATOR FOR SCREENING AERIAL RECONNAISSANCE FILM
Kenneth G. Leib, M. Ronald Wohlers, and Ronald Herold May 1977 70 p refs
(AD-A040426; RE-540) Avail: NTIS HC A04/MF A01 CSCL 17/8

An optical matched filter image correlator previously reported upon was used to perform a screening mission on aerial reconnaissance film with limited sampling of various terrain imagery. The sampling was limited to several scans of each image in the correlator plane. The target was generally recognizable when the signal-to-clutter ratio was in the range of one to ten dB depending upon the type of terrain and the band pass characteristics (or order) of the matched filter used. In some cases false alarm detection was experienced and a tradeoff between false alarms or clutter, and probability of detection can be made. The results obtained through the sampling of the correlation plane show that the probability of detection could be 99 percent for the most complex terrain encountered if 10.5 percent false alarm rate are also accepted. Thus, the correlator can perform the screening mission. Predictions on the system detection of targets in various terrain are given. Author (GRA)

N77-30451# Villanova Univ., Pa.
DEVELOPMENT OF A PROCUREMENT SPECIFICATION FOR AN IN-LINE CONTAMINATION MONITORING UNIT Final Report, Jan. 1975 - Oct. 1976
J. J. Coyle 14 Jun. 1977 123 p refs
(Contract N00156-75-C-0975)
(AD-A040969; NAEC-GSED-105) Avail: NTIS HC A06/MF A01 CSCL 14/2

The Millipore Micro-Scan Contamination Monitor and the HIAC Analog Particle Counter (PC120) underwent laboratory and field test of their ability to measure particulate contamination. Two Aluminum Oxide Hygrometers were laboratory tested for their ability to measure water in MIL-H-5606 hydraulic fluid. The results of the testing formed the basis for a procurement specification for an in-line contamination monitor. Author (GRA)

N77-30452# Watervliet Arsenal, N.Y.
ULTRASONIC AND ACOUSTIC HOLOGRAPHIC TECHNIQUES FOR INSPECTION OF COMPOSITE GUN TUBES AND OTHER WEAPON COMPONENTS
George P. Capsimalis, Giuliano DAndrea, and Ralph E. Peterson Mar. 1977 61 p refs
(AD-A039605; WVT-TR-77019) Avail: NTIS HC A04/MF A01 CSCL 19/6

Ultrasonic and acoustic holographic imaging has been shown to be an effective procedure for the nondestructive inspection of flaws and voids in composite and other material structures. Techniques for quantitatively imaging the size, shape and distribution of flaws in composites and conventional materials are dicussed. Additionally a number of test results representing applications of ultrasonic and holographic imaging and their adaptation to typical material testing problems are presented.
Author (GRA)

36 LASERS AND MASERS

Includes parametric amplifiers.

N77-30453 Illinois Univ., Urbana-Champaign.
DEMONSTRATION OF THE FIRST VISIBLE WAVELENGTH DIRECT NUCLEAR PUMPED LASER Ph.D. Thesis
Marvin Alfred Akerman 1976 81 p
Avail: Univ. Microfilms Order No. 77-8913

Experiments concentrated on mercury partial pressures in the range 2 to 10 mTorr at a total pressure of 600 Torr. The laser output increased as the mercury partial pressure was decreased, with an apparent saturation beginning at 2.5 mTorr. A single data point at 300 Torr total pressure and 2.5 mTorr showed a decrease in the laser output. To investigate possible lasing at higher mercury pressures, the total pressure was adjusted to 350 Torr with 2.8 Torr mercury partial pressure, but no lasing was observed at 6150 A. In addition to the laser experiments, gain measurements are described that use a chopped resonant cavity spectroscopy technique at a neutron flux too low to produce lasing. The gain measurements, successfully predicted the operating regime of the DNPL achieved while using the Sandia SPR II reactor. Dissert. Abstr.

N77-30454 City Univ. of New York.
LASER INDUCED ATOMIC FLUORESCENSE FROM Na SUB 2 Ph.D. Thesis
Jo-Lien N. Vang 1977 79 p
Avail: Univ. Microfilms Order No. 77-9962

A semi-classical analysis shows that the excitation will take place at the internuclear separation at which the laser line resonates with the difference between the ground and excited electronic states. The fluorescence is then proportional to the electronic transition moment at that internuclear separation. So

it is possible to map out the transition moment as a function of the nuclear separation R, by changing the laser frequency and picking out a series of R corresponding to a series of laser frequencies. Sodium was used as a sample and both Ar(+) and Kr(+) lasers to excite Na2 from ground state to excited state. By scanning the spectrometer through the D-line wavelength, we can collect the resulting D-line radiation through a photomultiplier and photon counting electronic which are interfaced with a PDP-8e computer. The spectra are stored in the PDP-8e and can be transferred to a PDP-10 computer for further analysis.
Dissert. Abstr.

N77-30455 Pennsylvania State Univ., University Park.
THERMAL AND FIELD EMISSION EFFECTS OF LASER RADIATION ON METAL WHISKER DIODES: APPLICATION TO INFRARED DETECTION DEVICES Ph.D. Thesis
Thomas E. Sullivan 1976 138 p
Avail: Univ. Microfilms Order No. 77-9739

Using the absorbed power as a source, detailed calculations are made of the laser induced temperature distrubutions in the diode. Values of the temperatures in the diode are found to be consistent with a thermal emission process. The laser induced electric fields are calculated using an antenna model for the whisker diode. Linear antenna theory is used to describe the receiving properties of the diode. The actual point geometry of the diode tip has been taken into account using Scheikunoff's theory of the conical antenna. The electric fields at the tip are found to be comparable with those necessary for field emission. The significance of the experimental results, on metal-vacuum-metal tunneling characteristics to the MOM tunneling hypothesis is discussed, and an experiment which may be used to determine the emission mechanism in the metal-metal point contact diode is presented.
Dissert. Abstr.

N77-30456*# Hughes Research Labs., Malibu, Calif.
EXCIMER LASERS Annual Report, 30 May 1975 - 10 Jun. 1976
A. J. Palmer, L. D. Hess, and R. R. Stephens Jul. 1976 91 p refs
(Contract NAS3-19707)
(NASA-CR-154843; AR-1) Avail: NTIS HC A05/MF A01 CSCL 20E

A theoretical and experimental investigation into the possibility of achieving CW discharge pumped excimer laser oscillation is reported. Detailed theoretical modeling of capillary discharge pumping of the XeF and KXe and K2 excimer systems was carried out which predicted the required discharge parameters for reaching laser threshold on these systems. Capillary discharge pumping of the XeF excimer system was investigated experimentally. The experiments revealed a lower excimer level population density than predicted theoretically by about an order of magnitude. The experiments also revealed a fluorine consumption problem in the discharge in agreement with theory.
Author

N77-30457*# Old Dominion Univ. Research Foundation, Norfolk, Va.
TEMPERATURE AND PRESSURE DEPENDENCE OF DICHLORO-DIFLUOROMETHANE (CF2C12) ABSORPTION COEFFICIENTS FOR CO2 WAVEGUIDE LASER RADIATION Progress Report, 1 Sep. 1976 - 30 Jun. 1977
Charles N. Harward Aug. 1977 58 p refs
(Grant NsG-1197)
(NASA-CR-154840; PGSTR-AP77-54) Avail: NTIS HC A04/MF A01 CSCL 20E

Measurements were performed to determine the pressure and temperature dependence of CFM-12 absorption coefficients for CO2 waveguide laser radiation. The absorption coefficients of CFM-12 for CO2 waveguide laser radiation were found to have no spectral structure within small spectral bandwidths around the CO2 waveguide laser lines in the CO2 spectral band for pressures above 20 torr. All of the absorption coefficients for the CO2 laser lines studied are independent of pressure above 100 torr, except for the P(36) laser CO2 spectral band. The absorption coefficients associated with the P(42) line in the same band showed the greatest change with temperature, and it also has the largest value of all the lines studied.
Author

N77-30458# Princeton Univ., N. J. Dept. of Chemistry.
COLLISIONAL STUDIES OF GASEOUS MOLECULAR LASERS
Herschel Rabitz May 1977 5 p refs
(Contract N00014-75-C-0478)
(AD-A040511; PR-5) Avail: NTIS HC A02/MF A01 CSCL 20/5

Molecular collision studies at Princeton are reviewed. The areas of research involved are: CO laser kinetics; Global Collision Theory; Quantum Number Scaling and the Analysis of Spectral Line Shapes; Stochastic Theory of Molecular Collisions; and Vibration-Rotation Relaxation in Molecular Collisions.
Author (GRA)

N77-30459# Colorado Univ., Boulder.
VIBRATION-TO-ELECTRONIC ENERGY TRANSFER FOR ELECTRONIC TRANSITION LASERS Interim Report
Stephen R. Leone 1 Dec. 1976 13 p refs
(Contract N00014-77-C-0115; ARPA Order 2840)
(AD-A040544) Avail: NTIS HC A02/MF A01 CSCL 20/5

A program has been developed to use spectroscopic insight and laboratory experiments to identify potentially important new laser candidates. An innovative series of visible and ultraviolet lasers on high temperature diatomic molecules has been discovered. To date both S2 and Te2 have been demonstrated to lase. Because of unique features of the diatomic molecular states, these molecules have potential to make highly efficient laser devices for DoD applications. In particular, S2 has numerous strong lasing transitions in the blue-green region of the spectrum for ONR applications, and many other laser lines in both the ultraviolet and red. The S2 laser lases to high vibrational levels in the ground state. These levels are not populated at the 600 C necessary to form dimers. Thus direct excitation schemes can produce very efficient conversion of energy to laser output. The S2 laser is able to withstand high power densities without degradation. It has all the usual desirable properties of gaseous systems for high average power and repetition rate. In addition the output will be line tunable over broad wavelength ranges. Collisions with rare gases serve to relax excited levels, but not quench the excited S2. Many other laser-suitable molecular species have been identified as well, by noting the desirable spectroscopic features of the S2 molecule. Te2 has already been shown to lase with the same efficacy as S2. Other candidates just within group VI elements include SO, Se2, TeS, TeO, TeSe, and SeS.
GRA

N77-30460# Naval Research Lab., Washington, D. C.
ANGULAR DISTRIBUTION OF LASER LIGHT SCATTERED FROM LASER-PRODUCED PLASMA AT HIGH IRRADIANCE
B. H. Ripin Apr. 1977 12 p refs
(AD-A039750; NRL-MR-3486) Avail: NTIS HC A02/MF A01 CSCL 20/9

Angular distributions of scattered laser light from Nd-laser-produced plasmas at irradiances between 10 to the 15th power and 10 to the 16th power W/sq cm were measured. Total reflectivities in the range of 20% to 50% are found. The total reflectivity remains approximately constant as the target is rotated from normal incidence up to 50-60 deg implying the existence of a steep density gradient near the critical density and/or absorption of laser light in the underdense region of the plasma.
GRA

N77-30461# Virginia Polytechnic Inst. and State Univ., Blacksburg. Coll. of Engineering.
KINETICS, ENERGETICS AND INFRARED LASING IN HIGH ENERGY ROCKET PROPELLANT INGREDIENTS AT CRYOGENIC TEMPERATURES Final Scientific Report
Henry A. McGee, Jr. Mar. 1977 76 p refs
(Grant AF-AFOSR-2109-71)
(AD-A040006; AFOSR-77-0650TR) Avail: NTIS HC A05/MF A01 CSCL 20/5

Electric discharge and pyrolytic activation combined with cryogenic quenching have been utilized to synthesize isolable quantities of unusual small compounds of the first row elements. Most are endothermic and stable only at low temperatures. Several of these species have been burned in laser cavities of several designs to explore their efficacy in producing population inversions.

Results have been generally disappointing, for no new lasers have been discovered, but work is continuing. Author (GRA)

N77-30462# Texas Univ. at Dallas, Richardson.
THE NITROGEN ION LASER Final Technical Report, 1 Jul. 1975 - 31 Mar. 1977
Carl B. Collins 31 Mar. 1977 47 p refs
(Contract N00014-76-C-0174; ARPA Order 1807; NR Proj. 016-211)
(AD-A039506; UTDP-ML-06) Avail: NTIS HC A03/MF A01 CSCL 20/5

The characterization and thermal scaling of the nitrogen ion laser pumped by charge transfer from He2(+) is reported in this work. Intense laser emission in the violet at 427 nm has been observed and found to have a linewidth less than 0.3A. The pumping ion, He2(+), was produced by discharge of a fast-pulsed electron beam gun, APEX-1, into several atmospheres of a mixture of helium and nitrogen. Excitation current densities ranged from 1.1 to 2.5 KA/sq cm at 1 MV over a 1 x 10 cm transverse geometry. Under these conditions the efficiency of the emission of 427 nm laser radiation was found to be proportional to the total pressure raised to the 1.2 power. Efficiencies of 1.6% relative to the energy lost by the electron beam in the radiating volume have been achieved in volumes of 16 cc at room temperature. Outputs of 35 mJ have been obtained from the 16 cc working volume at 30 atm pressure under these conditions. Thermal scaling of the laser has been investigated and a strong inverse dependence of laser output on gas temperature was observed. At -20C the output was found to increase to 80 mJ form the same volume containing helium at a density giving a pressure of 35 atm. at room temperature. This corresponded to an output efficiency of 3% relative to the energy deposited by the electron beam. Quasi-CW operation was achieved under these conditions suggesting that much longer output pulses might be obtained with an e-beam pulse of greater duration. GRA

N77-30463# Texas Technological Univ., Lubbock. Dept. of Physics and Engineering Physics.
HIGH POWER COHERENT X-RAY SOURCE AND SEARCH FOR X-RAY LASER Final Report, 1 Jun. 1972 - 31 Aug. 1976
Kamalaksha dasGupta Oct. 1976 27 p refs
(Grant AF-AFOSR-2373-72)
(AD-A039210; AFOSR-77-0603TR) Avail: NTIS HC A03/MF A01 CSCL 20/8

Non-divergent 'hot spot' from single crystals bombarded with electron beam from Febetron and Van de Graaff and sealed-off X-ray tube reveals discrete frequencies in bremsstrahlung. Stimulated Kossel line and radiative Auger Raman process have been observed in germanium crystal. Conical target X-ray tube bombarded by electrons at grazing angle give high contrast radiograph of materials and instruments. The observed coherent radiation has been profitably used for surface studies and could be used for development of X-ray holography. Author (GRA)

N77-30464# Naval Research Lab., Washington, D. C.
ARPA/NRL X-RAY LASER PROGRAM
Apr. 1977 288 p refs
(ARPA Order 269423)
(AD-A039833; NRL-MR-3482) Avail: NTIS HC A13/MF A01 CSCL 20/5

The ARPA/NRL X-ray laser program is concerned with demonstrating gain in the soft X-ray region. The overall program is jointly supported by ARPA and NRL. The approaches include electron-collisional pumping of ions, resonant charge transfer pumping, optical parametric mixing to short wavelengths, traveling wave e-beam and discharge pumping, and analysis and numerical modeling. This report covers the overall program for the ARPA portion as well as the progress made during the second half of FY-76 and FY-76T for both the ARPA portion and the continuing NRL effort. Author (GRA)

N77-30465# RCA Labs., Princeton, N. J.
INJECTION LASER FOR HIGH DATA RATE COMMUNICATIONS Final Report, 1 Mar. 1976 - 28 Feb. 1977
James P. Wittke, Ivan Ladany, and Henry Kressel Apr. 1977 49 p refs
(Contract N00014-76-C-0709)
(AD-A039992; PRRL-77-CR-13) Avail: NTIS HC A03/MF A01 CSCL 20/5

Injection lasers of AlGaAs (Lambda(L) approximately 800 nm) have been permanently bonded to single-mode fibers, with power levels up to 600 microwatts being coupled into the fibers. Values over 150 microwatts were consistently obtained under CW operation at room temperature. Very close mechanical alignment tolerances are required to achieve good coupling, with positioning to + or - 1 micrometer being required. This necessitates the use of bonding materials for attaching the fiber to the laser mount that have a high dimensional stability over long time periods, and lasers whose modal patterns do not change with time or operating conditions. An epoxy provided the best bonding material that we found, although there are indications that suitable low-melting solders can also be used. Laser mode changes with drive current level can alter the observed coupling efficiency significantly. GRA

N77-30466# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
MODEL FOR PREDICTING LASER SPECKLE PATTERNS RESULTING FROM ROUGH SURFACE SCATTERING M.S. Thesis
William E. Landis Mar. 1977 201 p refs
(AD-A039696; AFIT/GEO/EE/77-1) Avail: NTIS HC A10/MF A01 CSCL 20/5

The Air Force Weapons Laboratory (AFWL/ALO) expressed a need to know what characteristics of reflected laser radiation could effect the operation of the Adaptive Laser Optical Techniques (ALOT) tracking and pointing system. Because the radiation that is used for tracking is reflected from rough surfaces, the far field intensity pattern has a complex distribution of irradiance. This complex distribution of irradiance is called speckel. A computer model to calculate and plot laser speckle patterns was developed and tested. GRA

N77-30467# Ballistic Research Labs., Aberdeen Proving Ground, Md.
PROCEDURE FOR THE REDUCTION OF IR SCANNER DATA Final Report
J. Terrence Klopcic and John E. Kammerer Apr. 1977 64 p refs
(AD-A039919; BRL-MR-2744) Avail: NTIS HC A04/MF A01 CSCL 20/5

The IR scanning camera is widely accepted as the best source of real-time laser beam diagnostics. It is also the most detailed, and hence requires an extensive amount of data reduction and interpretation to produce a tractable output. The hardware, software and experience needed to process and display IR scanner data has been developed at BRL. The codes are production oriented, resulting in fast turn-around time with a minimum of tape handling. This report discusses the steps necessary in the IR scanner reduction process, including analytical bases for the smoothing and fitting portions of the scanner beam interpretation. Author (GRA)

N77-30468# Calspan Corp., Buffalo, N. Y.
TWO DIMENSIONAL EFFECTS IN LASER SOLID SIMULATION STUDIES Final Report, 1 Aug. 1973 - 31 Jul. 1973
J. W. Daiber and H. M. Thompson Oct. 1976 36 p refs
(Contract F44620-74-C-0004)
(AD-A039194; CALSPAN-WG-5376-A-3; AFOSR-77-0606TR) Avail: NTIS HC A03/MF A01 CSCL 20/5

The objective of this program was to study the two-dimensional wave motions induced in a target by high-power laser radiation. For these studies the target is an axisymmetric, supersonic free-jet of gas which is laser irradiated on axis. The transparency of the target permits luminosity and schlieren streak photography of the waves that propagate into the high-pressure plenum. Measurements of the axial and lateral luminous-plasma growth and of the axial shock-wave growth in the plenum have been obtained over a range of plenum pressures and laser powers. It has been found that the axial luminous-front growth can be predicted by a deflagration model; in this model the velocity scales with absorbed power is divided by gas reservoir pressure to the one-third power. The temperature of the gas behind the deflagration wave is predicted to vary with the velocity

squared. Temperature measurements which utilized metal-foil spectrometers to determine the relative X-ray flux in two wavelength invervals substantiated this scaling relation. The lateral expansion was found to be very slow, not even extending to the limits of the cone illuminated by the laser. Spontaneous magnetic fields are known to surround solid target during laser heating of their surfaces. Coil probes were used to determine if such fields existed near the laser-irradiated free-jet target and to measure the strength of these fields at several radial locations. An extrapolation of the data to the surface of the plasma indicates that azimuthal fields in excess of a megagauss exist. Such fields could retard the expansion of the plasma. Author (GRA)

N77-30469# Naval Research Lab., Washington, D. C.
A 100 J, 40 NSEC Q-SWITCHED Nd/GLASS LASER Final Report, Nov. 1974 - Dec. 1976
J. R. Greig and R. E. Pechacek Feb. 1977 48 p
(RR0110941)
(AD-A039610; NRL-MR-3461) Avail: NTIS HC A03/MF A01 CSCL 20/5

This report describes the characteristics of a high power Nd/glass laser presently in operation at the Naval Research Laboratory. The laser will produce 100 J of 1.06 micrometer radiation in a 40 nsec pulse, or in two pulses each of which is 40 nsec wide and separated by 300 nsec to 5 microsec. The divergence of the laser beam is approximately 0.0003 radian so that power densities in excess of 10 to the 13th power watts/sq cm can be achieved. This Nd/glass laser, is not 'state of the art' rather it is conservatively rated to provide reliable operation over long periods, with minimum maintenance.
Author (GRA)

N77-30470# Lockheed Missiles and Space Co., Palo Alto, Calif. Research Lab.
EXPERIMENTAL STUDY OF THE INITIATION MECHANISM OF LASER-SUPPORTED ABSORPTION WAVES Interim Report, 1 Jan. 1976 - 15 Feb. 1977
T. E. Sharp 22 Feb. 1977 37 p
(Contract F44620-75-C-0041)
(AD-A039212; LMSC-D556808; AFOSR-77-0616TR) Avail: NTIS HC A03/MF A01 CSCL 20/5

Mechanisms for prompt initiation of laser supported absorption waves are identified with their experimental consequences. A phenomenological theory of electron emission from metals under intense laser irradiation is discussed. A recent model for initiation of laser supported detonation waves which requires exceeding both irradiation and fluence thresholds is summarized. Experiments with 0.1 ns pulses of 1.06 micrometers laser light with irradiance from 8 to 250 Mw/sq cm on various aluminum targets in vacuum are described. Data are given for the time dependence and peak current density of electron emission as a function of laser irradiance and for the dependence of electron emission on laser polarization. The implications of the data for initiation mechanisms is discussed. GRA

N77-30471# Oregon Graduate Center for Study and Research, Beaverton.
PROPAGATION OF MULTIWAVELENGTH LASER RADIATION THROUGH ATMOSPHERIC TURBULENCE Final Report, 1 Feb. - 30 Nov. 1976
J. Kerr, Richard A. Elliot, Michael E. Fossey, J. Fred Holmes, and Myung H. Lee Jan. 1977 73 p refs
(Contract F30602-74-C-0082; ARPA Order 1279)
(AD-A036503; RADC-TR-77-18) Avail: NTIS HC A04/MF A01 CSCL 17/8

A complete theory is presented for the statistical effects of atmospheric turbulence on coherent radiation reflected from a diffuse target. This study, which is motivated by the need to understand speckle and scintillation effects on the operation of coherent adaptive optical transmitter (COAT) systems, constitutes a significant advance in the field of turbulence scattering phenomena. Both phase and amplitude perturbations are taken into account, and the analysis includes multiple scattering (saturation) conditions and finite receiver apertures. The development is free from certain restrictive assumptions employed in previous work, and yields results for the variance and covariance of irradiance which lead to clear physical insight. It is found that the covariance comprises two additive terms which represent respectively: (1) the incoherent scattering mechanism which is independent of source spectral width, and (2) the coherent mechanism related to 'speckles'. A technique is also developed for quantitative numerical predictions using resonable computer time. Results from an ongoing program of experimental verification are given which support the theory. GRA

37 MECHANICAL ENGINEERING

Includes auxiliary systems (non-power); machine elements and processes; and mechanical equipment.

N77-30472 Wayne State Univ., Detroit, Mich.
INVESTIGATION OF FUEL-DROPLET FLOW IN AN IDEALIZED AUTOMATIVE ENGINE INDUCTION SYSTEM Ph.D. Thesis
Robert Shin-chi Lo 1976 125 p
Avail: Univ. Microfiims Order No. 77-9421

The air, fuel vapor and droplets flow through an engine induction system which has been studied by a one dimensional two phase flow model that included evaporation and droplet coalescence. The conservation equations and pertinent constitutive relations are solved numerically. Previous results were reproduced to check the calculation accuracy and parametric studies of two-phase droplet flow in a straight pipe were carried out. Heating of manifold walls was found to be the most effective way to reduce droplet size and to improve evaporation. Other important parameters investigated included proper amounts of exhaust gas recirculation, fuel type and initial droplet size. The performance and effectiveness of a supersonic venturi with normal shock was also assessed. Dissert. Abstr.

N77-30473 Maryland Univ., College Park.
STRESS WAVE PROPAGATION IN BARS DUE TO NORMAL IMPACT ON WATER Ph.D. Thesis
William Thomas Messick 1976 414 p
Avail: Univ. Microfilms Order No. 77-10289

The stress wave response of solid, right circular cylindrical bars due to normal impact on an undisturbed water surface was investigated analytically and experimentally. The analytical problem was formulated as a two dimensional axisymmetrical elastic bar impacting on an initially perfectly flat, compressible water half space. The bar equations were derived in Lagrangian coordinates and a method of characteristics-finite difference solution was obtained. The response of the water was modeled as hydrodynamic and compressible, and the equations were formulated in Eulerian coordinates. A different method of characteristics - finite difference solution technique was used to obtain the solution to these water equations which contain convective terms. The interface between the bar and the water surface is tracked and continuity equations are applied. A computer program was written using these techniques to predict the stress wave response. Dissert. Abstr.

N77-30474*# California State Univ., Northridge. Dept. of Mechanics.
BALL TO SEPARATOR CONTACT FORCES IN ANGULAR CONTACT BALL BEARINGS UNDER THRUST AND RADIAL LOADS Status Report
Lester J. Nypan 30 Jul. 1977 110 p refs
(Grant NsG-3065)
(NASA-CR-153411) Avail: NTIS HC A06/MF A01 CSCL 13I

Experimental data is reported on ball to cage contact forces in a 110 mm bore ball bearing operating at speeds to 12000 rpm under radial and thrust loads. Information is also reported on cage to inner race land contact force, cage to inner race land clearance, and cage to shaft speed ratios. Author

N77-30475*# Kanner (Leo) Associates, Redwood City, Calif.
RELATIONSHIPS BETWEEN THE CURVATURES OF TOOTH SURFACES IN THREE-DIMENSIONAL GEAR SYSTEMS
F. L. Litvin Washington NASA Jul. 1977 14 p refs Transl. into ENGLISH from Z. Angew. Math. Mech. (East Germany), v. 49, no. 11, Nov. 1969 p 685-690
(Contract NASw-2790)
(NASA-TM-75130) Avail: NTIS HC A02/MF A01 CSCL 13I

A three-dimensional gear system between crossing and intersecting axes is considered under the assumption that the first derivative of the transmission ratio is zero in the vicinity of the point of contact. The following are obtained; (1) an equation that relates the normal curvatures of the tooth surfaces in the section that passes through the vector of relative velocity; (2) a relation between the principal curvatures and principal directions of the two tooth surfaces; and (3) new formulas for determining the reduced curvatures of the surfaces. Author

N77-30476# Boeing Commercial Airplane Co., Renton, Wash.
AN EXTENDED PREDICTION MODEL FOR AIRPLANE BRAKING DISTANCE AND A SPECIFICATION FOR A TOTAL BRAKING PREDICTION SYSTEMS, VOLUME 2 Final Report, Aug. 1975 - Dec. 1976
M. K. Wahl, S. M. Warren, and H. H. Straub Wright-Patterson AFB, Ohio ASD Mar. 1977 185 p
(Contract F33657-74-C-0129)
(AD-A039967; ASD-TR-77-6-Vol-2) Avail: NTIS HC A09/MF A01 CSCL 01/2

This report details the results from the sensitivity study portion of the Combat Traction II, Phase II (Extended) Program and also contains the calculations resulting from prediction equation formulation for the B-52, KC-135 and F-111 airplanes. GRA

N77-30477# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Mechanical Engineering.
NEAR MECHANISMS FOR METALLIC SURFACES IN SLIDING CONTACT Annual Report, Sep. 1975 - Oct. 1976
R. Komanduri and M. C. Shaw Oct. 1976 52 p refs
(Contract N00014-67-A-0314-0025)
(AD-A039958; AR-2) Avail: NTIS HC A04/MF A01 CSCL 20/11

(1) Spherical metal particles in the size range of 1/2 to 60 micrometers found when grinding chips are examined in the scanning electron microscope and a mechanism for their formation based on surface energy is presented. (2) Micron-sized spherical particles in sliding contact are found to reduce the static coefficient of friction, as with the case of larger-sized balls and rollers in bearings. (3) A mechanism for the accelerated wear of bearing surfaces due to the cutting action of the spherical particles between bearing surfaces in sliding contact is proposed and verified experimentally. (4) A potential method for reducing galling wear of materials at high speed sliding contact is presented using a newly developed alloy design that involves the atomization of the liquid alloy in an inert atmosphere and the consolidation of the resulting powder by sintering hydrostatically compressed billets. This results in a more uniform distribution of small sized carbides throughout the matrix as compared to nonuniform distribution of large sized carbides in the wrought material. Segregation of carbides can result in large areas of softer matrix which are potential regions for adhesion and consequent galling. Author (GRA)

N77-30478# Ohio State Univ., Columbus. Dept. of Welding Engineering.
OPTIMIZATION OF PERFORMANCE OF ARC WELDING USING FLUXES IN WELDED SHIP STRUCTURES FROM HY-100 AND HY-130 KPSI Progress Report
11 Mar. 1977 43 p refs
(Contract N00014-75-C-0666)
(AD-A039778) Avail: NTIS HC A03/MF A01 CSCL 13/8

The following report summarizes the progress made in the production of experimental high purity submerged arc fluxes for the welding of HY-130 Steels. The initial studies focused on the effects of flux basicity or acidity on weld metal oxygen content. This study indicates that oxygen levels in submerged arc weld metal are substantially reduced when very basic fluxes in the MgO-Al2O3-SiO2 system are used. The mechanical properties of the weldments produced with the very basic fluxes were not greatly improved. However, this trend may be attributed to a weld metal silicon content which exceeded 0.40%. Author (GRA)

N77-30479# Naval Ship Research and Development Center, Bethesda, Md. Performance Dept.
A FEASIBILITY STUDY OF THE HYBRID SIMULATION TECHNIQUE AS APPLIED TO LARGE SCALE CABLE DYNAMICS
Thomas L. Moran, Joan L. Lewis, and Walter H. Livingston Apr. 1977 65 p
(AD-A039952; SPD-767-01) Avail: NTIS HC A04/MF A01 CSCL 13/9

The development of a hybrid computer implementation for the equations of motion for an elastic cable in two dimensions is presented. The discrete element approach is used, in which the partial differential equations that represent the dynamics of the cable system are reduced to a set of 2N ordinary differential equations representing N nodes. A time share procedure is developed in which analog components are shared for different sections of the cable. The basic features of switching from one section to the next, and the logic that controls it, are developed using a simple second order system of two coupled equations. Then a sample cable problem (six foot buoy release using four nodes) is implemented in full on the hybrid computer, and the results are compared with solutions obtained by an all digital technique. Author (GRA)

N77-30480# Sikorsky Aircraft, Stratford, Conn.
THE 3000-HP ROLLER GEAR TRANSMISSION DEVELOPMENT PROGRAM. VOLUME 6: RELIABILITY AND MAINTAINABILITY REPORT Final Report
G. F. Gardner, K. R. Cormier, and B. Trustee Jan. 1977 179 p refs
(Contract DAAJ02-69-C-0042; DA Proj. 1G1-62207-AA-72)
(AD-A039381; USAAMRDL-TR-73-98F-Vol-6; UTRC/30974) Avail: NTIS HC A09/MF A01 CSCL 13/9

This report presents a summary of the testing conducted during the development of a 3000-HP Roller Gear Transmission. During this program a helicopter transmission using a 19.85 reduction ratio roller gear transmission was designed, manufactured, and subjected to extensive testing. A reliability analysis shows that a fully developed roller gear transmission offers comparable reliability to a conventional two-stage planetary unit. However, relating the development testing of the roller gear transmission to project the reliability is premature at this stage. The analysis does show that on-condition maintenance of the roller gear transmission is feasible. A summary of the testing and development of the roller gear transmission is included. Detailed reports on the design, manufacture, and bench and aircraft testing have been published separately. Author (GRA)

N77-30481# Boeing Commercial Airplane Co., Seattle, Wash.
THE 3-D STRESS ANALYSIS OF A TURBINE BLADES Final Report
C. M. Lewis, R. A. Samuel, and F. Yen Mar. 1977 86 p
(Contract DAAG46-75-C-0072)
(AD-A039176; D6-42735; AMMRC-CTR-77-14) Avail: NTIS HC A05/MF A01 CSCL 21/5

This report presents a demonstration of the usefulness of the ATLAS system in performing three-dimensional elastic stress analysis of a turbine blade. Modeling details for a shrouded uncooled turbine blade are outlined and program execution and data management techniques are discussed. GRA

N77-30482# Army Tank-Automotive Research and Development Command, Warren, Mich.
FLUIDIC TECHNOLOGY INVESTIGATION: SUSPENSION DAMPING SIMULATIONS Final Technical Report
James W. Grant, Steven A. Yollick, and Mel M. Steele Jan. 1977 174 p refs
(AD-A039901; TARADCOM-TR-12226) Avail: NTIS HC A08/MF A01 CSCL 13/7

The purpose of this investigation is to evaluate adaptive suspension damping devices, specifically those which employ fluidic controls, by means of hybrid computer simulations. The M151A2, 1/2 ton, 4 X 4, utility vehicle was first simulated to provide baseline data with which to compare the adaptive dampers. This investigation resulted in the definition of parameters which were given to the contractor who is building a breadboard of the Adaptive Fluidic Vibration Damper MOD IIB. Author (GRA)

N77-30483# Edgewood Arsenal, Aberdeen Proving Ground, Md.
SPHERICAL SHIELDS FOR THE CONTAINMENT OF EXPLOSIONS Technical Report, Jul. 1975 - Sep. 1976
Kevin P. Nelson Mar. 1977 25 p refs

(AD-A039454; EM-TR-76096) Avail: NTIS HC A02/MF A01 CSCL 13/4

Suppressive shields are designed to reduce the effects of an accidental explosion to a safe environment. One of these shields, a two-foot diameter sphere, completely contains the detonation of 1 pound of explosive and will be used to transport or store small quantities of explosives. Two of these shields have been fabricated from different steels and successfully tested, in fact surpassing all design requirements. Both shields have been approved for use in Army ammunition plants by the DOD Explosive Safety Board. Author (GRA)

N77-30484# Michigan Univ., Ann Arbor. Highway Safety Research Inst.
MODIFIED ARTICULATED VEHICLE SIMULATION Final Report, Apr. - Jun. 1976
J. E. Bernard and T. M. Kim Apr. 1977 72 p refs
(Contract DOT-NHTSA-6-5547)
(PB-266963/8; UM-HSRI-76-23; DOT-HS-802325) Avail: NTIS HC A04/MF A01 CSCL 13F

An overview of the analytical problem is presented, followed by an explanation of the analytical problem is presented, followed by an explanation of the kinematics and some details of the new software. The kinematics section is closely linked to the software by relating equations in the text to line numbers in the computer program. Next, some sample computer runs introduce the input/output of the modified simulation. A flow chart and a list of the modified program are given in the appendix. GRA

N77-30284*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
REAL TIME COMPUTER CONTROLLED WELD SKATE
William A. Wall *In its* Proc. of the ASPE/MSFC Symp. on Eng. and Productivity Gains from Space Technol. May 1977 p 159-164 (For primary document see N77-30273 21-31)
Avail: NTIS HC A13/MF A01 CSCL 13H

38 QUALITY ASSURANCE AND RELIABILITY

Includes product sampling procedures and techniques; and quality control.

N77-30485# Naval Postgraduate School, Monterey, Calif.
A STUDY OF THE EVOLUTION OF THE RELIABILITY AND MAINTAINABILITY ENGINEERING DISCIPLINES M.S. Thesis
Joseph A. DiPasquale, Thomas A. Hamilton, and Robert L. Masten Mar. 1977 112 p refs
(AD-A039949) Avail: NTIS HC A06/MF A01 CSCL 14/4

The purpose of this thesis is to trace and analyze the evolution of reliability and maintainability as engineering disciplines. Articles published in the open literature were used as the measurement indicator for developing the growth curves of the various branches within each discipline. The growth curves were analyzed to determine the present emphasis and to project future trends within each discipline. Analyses were conducted to determine the relative contributions made to the growth patterns by private and public organizations such as the Department of Defense, Service Industries, etc. Elements of each discipline which indicate probable future developments have been identified. Where possible, the factors contributing to future growth have also been identified. Taxonomies have been developed which provide a structured classification system for the various elements within each discipline. The authors believe that the taxonomies, in conjunction with the growth curves, present a comprehensible analysis of the evolution of the reliability and maintainability disciplines. Author (GRA)

N77-30486# Naval Postgraduate School, Monterey, Calif.
A RELIABILITY MODEL FOR STORED ITEMS REQUIRING REWORK REQUIRING REWORK M.S. Thesis
James Guy Bohannan Mar. 1977 51 p refs
(AD-A039167) Avail: NTIS HC A04/MF A01 CSCL 14/4

A mathematical model is developed for a system of stored items which are periodically reworked to improve their reliability. Expressions are developed for the expected reliability of the stored items and for the probability that the reliability of an item will exceed a required reliability. These expressions are developed first for the transient start-up phase where new items enter an initially empty system, then for the continuous rework phase where items are being reworked and returned to storage, and finally for the transient replacement phase where the old items are being replaced by new or different items. Numerical examples are presented to demonstrate the use of the expected reliability and probability expressions. Author (GRA)

N77-30487# Air Force Weapons Lab., Kirtland AFB, N.Mex.
TRUNCATION OF THE DISTRIBUTION OF PARTS FAILURES BY SCREENING Final Report
R. D. Chronister and R. J. Maier Mar. 1977 38 p refs
(AD-A039835; AFWL-TR-76-247) Avail: NTIS HC A03/MF A01 CSCL 15/5

The value of acceptance test screening as a quality assurance tool is explored from the viewpoint of radiation hardness assurance. Since parts failures that occur due to the application of extreme environments such as radiation can most frequently be described using the normal distribution, the bivariate normal distribution is assumed. Numerical and graphical tabulations of the distribution failures are presented for various screening levels below which all parts are rejected. In this report the calculations required to evaluate acceptance test screening as a radiation hardness assurance tool are explained and the methods of estimating the error resulting from assuming normal distribution detailed. Examples are given to show that poorly correlated screens are nevertheless useful for radiation hardness assurance when extreme radiation levels are not anticipated and that hardening by screening is unproductive when high radiation levels are anticipated. GRA

39 STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; and thermal stress.

For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance*.

N77-30488 Michigan Univ., Ann Arbor.
EFFECT OF THE SPATIAL DISTRIBUTION OF IMPULSIVE LOADS ON DYNAMIC SNAP-THROUGH STABILITY OF A SHALLOW CYLINDRICAL SHELL Ph.D. Thesis
Eric Raymond Johnson 1976 199 p
Avail: Univ. Microfilms Order No. 77-7949

The dynamic stability of a simply supported shallow arch is reexamined. A new derivation of the governing equations for this problem is presented. The dynamic analysis consists of a numerical integration of an approximate set of equations obtained by a Galerkin expansion of the shell displacement. This approximate model of the shell is shown to be qualitatively correct based on a comparison with the topography of the exact potential energy surface. Response measures are defined for snap-through occurring on the initial oscillation of the response (immediate snap-through), and for snap-through which occurs after several oscillations (finite time snap-through). It is demonstrated that for nonsymmetric distributions the jump criterion is not very precise. A consistent interpretation is employed to determine the critical initial velocity, and the range of subjectivity identified. Dissert. Abstr.

N77-30489 North Carolina State Univ., Raleigh.
ANALYSIS OF RECTANGULAR PLATES WITH TWO SETS OF COMPOSITE RIBS Ph.D. Thesis
William Wirt Payne, Jr. 1976 131 p
Avail: Univ. Microfilms Order No. 77-2752

Discrete field analysis techniques were used to derive an exact model for a rectangular plate stiffened by two sets of orthogonal beams. The mathematical models are based on classical plate theory, plane stress elasticity, and elementary beam theory. Using the macro approach of discrete field analysis results in a set of simultaneous equations in which the unknowns are

coefficients of a Fourier expansion. Three cases were analyzed: (1) non composite flexural analysis, (2) composite membrane analysis, and (3) composite membrane-flexural analysis. For each case, three boundary conditions were considered: (1) simple side supports, (2) flexible boundaries on two parallel sides, and (3) flexible boundaries on all sides. Dissert. Abstr.

N77-30490 Cornell Univ., Ithaca, N.Y.
ELASTIC AND INELASTIC LOCAL BUCKLING AND POST-BUCKLING BEHAVIOR OF UNSTIFFENED COMPRESSION ELEMENTS Ph.D. Thesis
Venkatakrishnan Kalyanaraman 1976 381 p
Avail: Univ. Microfilms Order No. 77-8356

The elastic and inelastic local buckling and elastic postbuckling behavior of unstiffened elements in cold-formed steel members and their effects on bending of beams and overall flexural buckling of columns have been investigated. An analytical investigation of the elastic and inelastic local buckling and the elastic postbuckling behavior of unstiffened elements with an elastic rotational edge restraint has been carried out. Results of experiments on short columns, long columns and beams are presented and compared with the analytical solution.
Dissert. Abstr.

N77-30491 Virginia Polytechnic Inst. and State Univ., Blacksburg.
A PHOTOELASTIC TECHNIQUE FOR THE DETERMINATION OF STRESS INTENSITY FACTORS Ph.D. Thesis
Mitchell Ira Volles 1976 100 p
Avail: Univ. Microfilms Order No. 77-2766

The stress intensity determination is accomplished without resorting to stress separation methods through employing an expression for the maximum in-plane shearing stress consisting of a singular term which is related to the stress intensity factor and a constant term which is related to the regular stress field. The technique itself identifies the zone dominated by the singular stresses. The application of the technique to a variety of technologically important three dimensional problems is illustrated for Mode 1 loading and combined Mode 1 - Mode 2 loading. The major advantages and limitations of the technique are discussed. Replications of identical test geometries indicate a scatter of the stress intensity factor determination of less than + 5%. It is concluded that the method is a valid means for the independent determination of values of the stress intensity factor. Dissert. Abstr.

N77-30492 Minnesota Univ., Minneapolis.
THE VIBRATION OF ELASTIC AND VISCOELASTIC ROTATING SHAFTS Ph.D. Thesis
Manohar Lakshman Badiani 1976 152 p
Avail: Univ. Microfilms Order No. 77-6929

For the symmetric shaft, governing equations of motion are developed using Timoshenko's beam theory. The shaft is assumed to have a constant circular cross-section and rotate in symmetric bearings represented by simply supported end conditions. The viscoelastic equations are obtained from the elastic equations using the correspondence principle. They are then studied by separating the time variable by a direct dual eigenfunction expansion, the characteristic functions of the elastic shaft being used for the expansion of the viscoelastic solution. It is assumed that the material is incompressible and has linear viscoelastic properties (Kelvin model). It is found that for the elastic shaft, there are two types of critical speeds; one corresponding to the bending mode (bending critical speed) and one corresponding to the shear mode (shear critical speed). The simply supported unsymmetric shaft is similarly analyzed. Dissert. Abstr.

N77-30493 State Univ. of New York, Stony Brook.
STRESS DISTRIBUTION IN THE VICINITY OF A CRACK IN NON-HOMOGENEOUS WEDGES Ph.D. Thesis
Tai-Yih Chang 1976 126 p
Avail: Univ. Microfilms Order No. 77-7772

The problem of two bonded dissimilar materials containing a crack along the bonding line was analyzed. Because of the wedge-shaped domain, the Mellin transform was used to attack the problem; the regularity conditions of the transform are also discussed. The mixed conditions on the interface give rise to two pairs of dual integral equations, which were then reduced to a pair of coupled Cauchy type singular integral equations of the second kind. These integral equations were solved in conjunction with the continuity conditions of the displacements at the ends of the crack. Since the displacements are no longer continuous at the open end of an apex crack, a hypothesis of maximum displacements at the open end is proposed. The stresses and the stress intensity factors were determined for an embedded crack as well as for an apex crack. The results also show that the hypothesis proposed for the apex cracks is valid for pressure loading but is questionable for shear loading. Dissert. Abstr.

N77-30494 Tennessee Univ., Knoxville.
FINITE ELEMENT CREEP ANALYSIS OF AXISYMMETRIC STRUCTURES USING LINEAR PATH FUNCTIONS Ph.D. Thesis
Robert Michael Pardue 1976 142 p
Avail: Univ. Microfilms Order No. 77-10793

Examples are given which illustrate the advantages of the technique over that of the constant stress approach used by numerous investigators. These examples show that the execution time of a typical finite element program to compute the solution of a creep problem to a given accuracy is reduced by a factor of four or more, depending upon the problem. Also it is shown that the stability limit on time increment for the linear path method is probably as large or larger than that for the constant stress method. Dissert. Abstr.

N77-30495 California Inst. of Tech., Pasadena.
LINEARIZATION TECHNIQUES FOR NON-LINEAR DYNAMICAL SYSTEMS Ph.D. Thesis
Polihronis-Thomas Dimitrios Spanos 1977 164 p
Avail: Univ. Microfilms Order No. 77-10473

The applicability of the method for determination of the amplitudes and phases of the approximate steady-state solution of a multi-degree-of-freedom non-linear system under harmonic monofrequency excitation is considered. The implementation of the method for several special classes of non-linear functions is discussed in detail. In addition, the manner in which the method may be applied to generate an approximate solution for the convariance matrix of the stationary random response of a multi-degree-of-freedom dynamical system subjected to stationary Gaussian excitation is outlined. The method for transient response is applied to the random response of a Duffing Oscillator and a Hysteretic System. The solution for the Duffing Oscillator is compared with data obtained by a Monte Carlo study.
Dissert. Abstr.

N77-30496 Lehigh Univ., Bethlehem, Pa.
STRESS CONCENTRATION AND FATIGUE OF WELDED DETAILS Ph.D. Thesis
Nicholas Zettlemoyer 1976 327 p
Avail: Univ. Microfilms Order No. 77-10709

Both fillet- and groove-welded details are studied. The findings show that stiffeners welded to flanges have a maximum stress concentration factor between three and four. Cover plates with transverse end welds have a maximum concentration factor between six and eight. Gusset plates groove-welded to flange tips and possessing circular transitions at their ends generally exhibit a maximum concentration factor below three. Lap-welded gussets are similar to cover plates which have a greater width than the flange. Longitudinal stiffeners with circular transitions are comparable to groove-welded gussets with circular transitions. Longitudinal stiffeners and groove-welded gussets without circular transitions are roughly analogous to stiffeners with the weld angle depending on taper. The stress concentration distribution along the prospective crack path is translated into a stress intensity correction factor, depending on crack length, through use of the Green's Function proposed by Albrecht.
Dissert. Abstr.

N77-30497 North Carolina State Univ., Raleigh.
CREEP-RUPTURE DATA ANALYSIS: ENGINEERING APPLICATION OF REGRESSION TECHNIQUES Ph.D. Thesis
Donald Robert Rummler 1976 87 p
Avail: Univ. Microfilms Order No. 77-11165

The results of investigations to apply regression techniques to the development of methodology for creep-rupture data analysis are presented. Regression analysis techniques are applied to the

explicit description of the creep behavior of materials for space shuttle thermal protection systems. A regression analysis technique is then compared to five parametric methods for analyzing three simulated and twenty real data sets. Finally, a computer program for the efficient evaluation of creep- rupture data with five parametric methods is presented. Dissert. Abstr.

N77-30498 Industrieanlagen-Betriebsgesellschaft m.b.H., Ottobrunn (West Germany).

FATIGUE STRENGTH IMPROVEMENT OF TYPICAL MACHINE COMPONENTS BY MEANS OF RESIDUAL COMPRESSIVE STRESSES

Walter Schuetz and P. Schrader 1976 20 p refs Presented at the Soc. of Environ. Engr. Intern. Conf. on Fatigue Testing and Design, London, 5-9 Apr. 1976

(ICAF-952) Copyright. Avail: Issuing Activity

The possibilities to increase fatigue life, i.e. improved materials, improved detail design and artificially induced residual compressive stresses, are critically compared. A large research program is then described in which a number of promising methods to improve fatigue life was investigated. The effect of the parameter variations was judged by S-N tests; the optimum parameter was then tested under realistic loads, i.e. flight-by-flight or random sequences. The residual static stresses by shot peening have been measured before and during the fatigue tests. It is concluded that: (1) large improvements in fatigue life are possible even under realistic stresses and sequences, using shot peening, coining and surface rolling, (2) this effect cannot be explained by residual stresses alone, at least for the Al-alloy; and (3) even titanium alloys can be successfully coined, even a very high strength steel can be successfully surface rolled. Author

N77-30499*# Illinois Univ., Urbana. Dept. of Theoretical and Applied Mechanics.

SMALL DEFLECTION OF A CLASS OF CLAMPED THIN PLATES USING COLLOCATION

Will J. Worley Jul. 1977 46 p refs

(Grant NGR-14-005-010)

(NASA-CR-150373; UILU-ENG-77-6005; T/AM-418) Avail: NTIS HC A03/MF A01 CSCL 20K

Equations are given for the optimization of a class of two-and three-dimensional structures. The application of existing analytical techniques to the response of thin clamped plates is described. The ratios of deflections to plate thickness are given for uniform transverse loads as well as for uniform plus linearly varying transverse loads. Deflections are presented at angular increments of 5 degrees and at radial increments of 0.1 of the radius. Author

N77-30500*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

C-SHAPED SPECIMEN PLANE STRAIN FRACTURE TOUGHNESS TESTS

R. T. Buzzard and D. M. Fisher Jul. 1977 20 p refs

(NASA-TM-73731; E-9291) Avail: NTIS HC A02/MF A01 CSCL 20K

Test equipment, procedures, and data obtained in the evaluation of C-shaped specimens are presented. Observations reported on include: specimen preparation and dimensional measurement; modifications to the standard ASTM E 399 displacement gage, which permit punch mark gage point engagement; and a measurement device for determining the interior and exterior radii of ring segments. Load displacement ratios were determined experimentally which agreed with analytically determined coefficients for three different gage lengths on the inner surfaces of radially-cracked ring segments. Author

N77-30501# Industrieanlagen-Betriebsgesellschaft m.b.H., Ottobrunn (West Germany).

CRACK PROPAGATION AND RESIDUAL STATIC STRENGTH OF TYPICAL AIRCRAFT FORGINGS

Walter Schuetz 1976 23 p refs Presented at the AGARD Specialists Meeting, Fracture Mech. Design Methodology, London, 28-29 Sep. 1976 Sponsored by Ministry of Defence, Federal Republic of Germany

(ICAF-954) Avail: NTIS HC A02/MF A01

A test program was carried out using nose landing gear struts manufactured to the same drawings, but forged by several forges in different countries. Cracks were introduced in various sections of the forgings and crack propagation and residual static strength determined by test and compared with calculations. It was not possible to predict residual static strength with any accuracy even if an ASTM-CT specimen was taken out of the same forging near the failure location. Crack propagation under two realistic load sequences was highly irregular and could not be correctly predicted using the Willenborg retardation model. Also, scatter of the above properties was much larger than for the sheet and plate specimens normally used for such tests. The conclusions to be drawn from these results are shortly discussed and the urgent need for further work is stressed. Author

N77-30502# Laboratorium fuer Betriebsfestigkeit, Darmstadt (West Germany).

CRITERIA FOR THE INTRODUCTION AND APPLICATION OF STANDARDIZED LOAD SEQUENCES PRESENTED BY WAY EXAMPLE OF THE STANDARDS TWIST AND FALSTAFF

H. Lowak 1977 12 p refs In GERMAN; ENGLISH summary

(ICAF-961) Avail: NTIS HC A02/MF A01

Criteria for introduction and application of standardized load sequences for fundamental investigations of fatigue problems are presented. It is shown by the application of digital computer and by use of standardized load sequences (for example TWIST and FALSTAFF) the fatigue life estimation is improved. Author

N77-30503# Massachusetts Inst. of Tech., Cambridge.

IMPULSIVE LOADING OF AN IDEAL FIBRE-REINFORCED RIGID-PLASTIC BEAM Interim Report

F. Laudiero and Norman Jones Mar. 1977 26 p refs

(Contract N00014-76-C-0195; Grant NSF ENG-75-13642)

(AD-A039912; Rept-77-3) Avail: NTIS HC A03/MF A01 CSCL 13/13

This article examines the dynamic plastic response of an impulsively loaded ideal fibre-reinforced (strongly anisotropic) rigid-plastic beam. It is demonstrated that the response duration and permanent transverse displacements are significantly less than the corresponding quantities in an equivalent rigid perfectly plastic isotropic beam. Author (GRA)

N77-30504# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.

CUTOUT REINFORCEMENT OF STIFFENED CYLINDRICAL SHELLS M.S. Thesis

James Anthony Cervantes Mar. 1977 97 p refs

(AD-A039162; AFIT-GAE/MC/76-D-2) Avail: NTIS HC A05/MF A01 CSCL 13/13

A study was carried out to determine the optimum placement and volume of a reinforcing frame around a cutout in an axially loaded stringer and ring and stringer stiffened cylindrical shell. The problem was analyzed using the linear bifurcation portion of STAGS (Structural Analysis of General Shells). Four parameters were varied; stringers versus rings and stringers, cutout size, ratio of frame volume to cutout volume, and frame position. It appeared that in most cases the position with the frame next to the cutout edge was the most effective. This can be attributed to the frame's ability to delay the onset of local buckling. However, there was a relative maximum in the frame distance versus critical load curves for a frame positioned away from the cutout edge at a low ratio of frame to cutout volume. Author (GRA)

N77-30505# Cranfield Inst. of Technology (England). Div. of Aircraft Design.

OPTIMUM DESIGN OF AN IMPERFECT CORRUGATED TOWER Final Scientific Report, 11 Mar. 1975 - 10 Mar. 1977

D. M. Richards 10 Mar. 1977 17 p refs

(Grant AF-AFOSR-2847-75; AF Proj. 9767)

(AD-A039237; EOARD-TR-77-03; SR-2) Avail: NTIS HC A02/MF A01 CSCL 13/13

The optimum design of a thin-walled corrugated tower is considered. The walls are corrugated, and have imperfections. Explicit expressions for the optimum (minimum weight) design are derived, and used to compare weight sensitivity to imperfection magnitude with strength sensitivity. Author (GRA)

N77-30506# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Civil Engineering.

STRUCTURAL DESIGN BY SINGULAR IMBEDDING Ph.D. Thesis

Wiwat Sangtian, Charles H. Goodspeed, and Steven J. Fenves Mar. 1977 52 p refs

(Contract N00014-76-C-0354)

(AD-A039385; R-77-4) Avail: NTIS HC A04/MF A01 CSCL 13/13

Numerous structural analysis programs are available today to assist in the structural design process. However, the complete structural design involves not only analysis, which determines the structural response on the basis of given element properties, but also the selection of element properties so that imposed constraints (e.g. stresses and displacements) are met. Today, two general methods are available for designing structures to meet specified constraints: optimization methods, in which the analysis and the satisfaction of constraints are performed simultaneously, but at great expense; and iterative schemes, where successive analyses and modifications performed through a man-computer interaction until the constraints are specified. The objective of this study is to develop a combined method for designing selected components of a structure subject to a set of performance criteria simultaneously with the analysis process. Author (GRA)

N77-30507# Army Construction Engineering Research Lab., Champaign, Ill.

A UNIFIED APPROACH FOR MODELING INELASTIC BEHAVIOR OF STRUCTURAL METALS UNDER COMPLEX CYCLIC LOADING Final Report

H. R. Jhansale May 1977 44 p refs

(DA Proj. 4A7-62719-AT-41)

(AD-A040741; CERL-TR-M-214) Avail: NTIS HC A03/MF A01 CSCL 13/13

This report develops a general procedure for modeling the inelastic stress-strain response of structural metals subjected to complex irregular cyclic loadings. The model is ideally suited for programming on a digital computer and uses 'cyclic' material parameters (or properties) determined from simple constant strain amplitude cyclic tests. Four model formulations which include three degrees of simplification in the model are proposed and their appropriate applications are indicated. In its most complete formulation, the model is capable of simulating all the important observed phenomena of a wide range of structural metals, including hotworked and coldworked steels and aircrfaft aluminums. These phenomena include 'memory' of prior history, cyclic hardening, cyclic softening, cyclic relaxation, cyclic creep, and the observed deviation from the Masing behavior. A major contribution of this report is in the development of a unified characterization of these phenomena. The model and the 'cyclic' material parameters developed provide the necessary base for formulating a general constitutive equation in the multiaxial state of stress. Such constitutive equations are directly adoptable in the finite element codes of nonlinear structural analysis programs. The model is also useful in realistic shakedown analysis of structures and fatigue analysis of complex load histories. Author (GRA)

N77-30508# Army Construction Engineering Research Lab., Champaign, Ill.

INFLATION/FOAM/SHOTCRETE SYSTEM FOR RAPID SHELTER CONSTRUCTION Final Report

G. R. Williamson, A. Smith, D. Morse, M. Woratzeck, and H. Barrett May 1977 28 p refs

(DA Proj. 4A1-62719-AT-41)

(AD-A040789; CERL-TR-M-215) Avail: NTIS HC A03/MF A01 CSCL 13/13

This report discusses an inflation/foam/shotcrete system for constructing hardened shelters in the theater of operations. The method was found to be rapid and low-cost, with a low skill level requirement. Five hemispherical domes of varying sizes and foam thicknesses were constructed and tested to determine their resistance to fire, ballistics, and simulated burial. Costs, man-hours, and skill levels required for construction are discussed. Author (GRA)

N77-30509# California Univ., Los Angeles. School of Engineering and Applied Science.

ON THE RELATION BETWEEN THE FRACTURE STATISTICS OF VOLUME DISTRIBUTION AND SURFACE DISTRIBUTED CRACKS Technical Report, 1976 - 1977

S. B. Batdorf, D. J. Chang, and G. H. Sines Feb. 1977 23 p refs Sponsored in part by AFOSR

(Contract N00014-76-C-0445)

(AD-A040241; UCLA-ENG-7723) Avail: NTIS HC A02/MF A01 CSCL 13/13

A weakest link theory for failure of brittle materials containing randomly oriented cracks uniformly distributed throughout the volume is compared with an analogous theory for surface distributed cracks. In the latter theory all crack planes are assumed to be normal to the surface in which they are located. In both theories failure is assumed to occur when the component of stress normal to a crack plane exceeds the strength of the crack. It is shown for both theories that the distribution of crack critical strength can be given in closed form when the failure statistics in simple tension are known. It is also shown that the predicted biaxial failure statistics based on given uniaxial statistics are the same, regardless of which theory is used. Evidence is cited which suggests that the latter result may hold for shear-sensitive as well as shear-insensitive cracks. Author (GRA)

N77-30510*# California Univ., Livermore. Lawrence Livermore Lab.

ADVANCED TECHNOLOGY FOR MINIMUM WEIGHT PRESSURE VESSEL SYSTEM

M. A. Hamstad, E. S. Jessop, and R. H. Toland Feb. 1977 12 p refs

(NASA Order C-13980-C; Contract W-7405-eng-48)

(NASA-CR-154833; UCID-17399) Avail: NTIS HC A02/MF A01 CSCL 11D

Bosses were made of fiber/resin composite materials to evaluate their potential in lightweight pressure vessels. An approximate 25% weight savings over the standard aluminum boss was achieved without boss failures during burst tests. Polymer liners and metal liners are used in fiber composite pressure vessels for containment of gases. The internal support of these liners required during the filament winding process has previously been provided by dissolvable salt mandrels. An internal pressurization technique has been developed which allows overwinding the liner without other means of support and without collapse. Study was made of several additional concepts including styrene/Saran, styrene/flexible epoxy. ERA

N77-30511# Naval Construction Research Establishment, Dunfermline (Scotland).

THE J INTEGRAL. A REVIEW OF THEORY AND A SUGGESTED METHOD FOR J SUB c DETERMINATION

J. D. G. Sumpter Aug. 1976 29 p refs

(NCRE/R614; BR53650) Avail: NTIS HC A03/MF A01

Following a review of the theoretical justification for the use of J sub c as an elastic-plastic fracture criterion, a new method for its laboratory determination is suggested. Advantages of the new method include: unambiguous continuity with K sub c; full compatibility with the existing standard for COD (Crack Opening Displacement) testing; and an ability to deal with slow crack growth and the effects of lateral constraint. An outline of future work and detailed instructions for the determination of J sub c in a 3pt bend specimen with a crack length to width ratio of between 0.25 and 0.6 is given. Author (ESA)

N77-30512# Naval Research Lab., Washington, D. C.

CONCEPTS OF FRACTURE TOUGHNESS AND STRUCTURAL INTEGRITY Final Report

F. J. Loss 31 Mar. 1977 36 p refs

(Contract AT(49-24)-0207)

(AD-A038828; NRL-8085) Avail: NTIS HC A03/MF A01 CSCL 11/6

The concept of fracture toughness is introduced. The factors that determine the toughness levels of structural steels are discussed in terms of strength and temperature transitions, strain rate dependence, and mechanical constraint. Test procedures for measuring toughness are highlighted, beginning with linear-elastic fracture mechanics and including such engineering tests as the Charpy-V, Dynamic Tear, and Drop-Weight NDT tests. However,

advanced research topics involving elastic-plastic toughness, such as the J-integral, are beyond the scope of the discussion. Finally, the applicability of the various test procedures to analysis of structural integrity is discussed. Author (GRA)

N77-30513# Lockheed Missiles and Space Co., Palo Alto, Calif.
COMPUTATIONAL ASPECTS OF TIME INTEGRATION PROCEDURES IN STRUCTURAL DYNAMICS. PART 1: IMPLEMENTATION. PART 2: ERROR PROPAGATION
K. C. Park and C. A. Felippa Jan. 1977 117 p refs
(Contract N00014-74-C-0355)
(AD-A039784; LMSC/D556247) Avail: NTIS HC A06/MF A01 CSCL 09/2

A unified approach for the implementation of direct time integration procedures in structural dynamics is presented. Two key performance assessment factors are considered, viz., computational effort and error propagation. It is shown that these factors are strongly affected by details in the reduction of the second-order equations of motion to a system of first-order equations, and by the computational path followed at each time step. Part I is primarily devoted to the study of the organization of the computational process. Specific implementation forms derivable from the unified approach are studied in detail, and rated accordingly. Author (GRA)

N77-30514# Watervliet Arsenal, N.Y.
ON STABILITY OF FREE-FREE BEAMS WITH AND WITHOUT DIRECTIONAL CONTROL
J. J. Wu Dec. 1976 22 p refs
(AD-A036672; WVT-TR-76049) Avail: NTIS HC A02/MF A01 CSCL 16/4

This report presents some new findings and revised data concerning the stability of a uniform free-free beam subjected to a constant thrust with and without directional control. An analysis is performed first showing that, other than the first branch of zero eigenvalues which correspond to rigid body translation modes, there can be only a set of discrete values of the thrust which admit zero eigenvalues. Then, stability data, revised from previous results with a numerical error eliminated, are presented. Conclusions on the beam's stability are drawn from these new evidences. Author (GRA)

N77-30515# Northwestern Univ., Evanston, Ill. Dept. of Materials Science.
A COMPREHENSIVE PROGRAM FOR AUTOMATING RESIDUAL STRESS MEASUREMENTS BY X-RAYS
M. R. James and J. B. Cohen 15 Apr. 1977 35 p refs
(Contract N00014-75-C-0580)
(AD-A039112; TR-16) Avail: NTIS HC A03/MF A01 CSCL 20/11

The software design of a complete computer controlled X-ray residual stress is described. The program will operate using either a position sensitive detector or a diffractometer for data accumulation. For use with a diffractometer, optimization of the time of data accumulation for a prescribed statistical counting error is presented. The peak location routine using a multiple pass refinement of the peak position is detailed. GRA

N77-30516# Air Force Flight Dynamics Lab., Wright-Patterson AFB, Ohio.
THE DEVELOPMENT AND SOLUTION OF BOUNDARY INTEGRAL EQUATIONS FOR CRACK PROBLEMS IN FRACTURE MECHANICS Final Technical Report, 1 Jul. 1973 - 30 Jun. 1975
Louis T. Montulli Nov. 1976 180 p refs
(AF Proj. 1367)
(AD-A039814; AFFDL-TR-76-116) Avail: NTIS HC A09/MF A01 CSCL 20/11

The elastostatic Boundary Integral Equation (B.I.E.) method is mathematically extended to include closed crack plane boundary value problems under general loading. The B.I.E. is formulated for a modified open crack geometry. By the formulation of a sum and difference state over the crack surfaces, a limit operation closing the crack is successfully performed. The resulting integral equation set is solved for two example problems possessing known solutions. The stress intensity factors, K(I), K(II), and K(III), and the resulting strain energy of the body are calculated and found to be accurate within 1% when compared to the analytical solution. The bent edge crack in a finite circular disk subject to mixed mode loading is investigated. Initial crack trajectories are predicted using the strain energy release rate criterion and compared to known results. Author (GRA)

N77-30517# Georgia Inst. of Tech., Atlanta. School of Engineering Science and Mechanics.
THE EFFECT OF INITIAL IMPERFECTIONS ON OPTIMAL STIFFENED CYLINDERS UNDER COMPRESSION
George J. Simitses and Izhak Sheinman Feb. 1977 116 p refs
(Grant AF-AFOSR-2655-74)
(AD-A039148; AFOSR-77-0639TR) Avail: NTIS HC A06/MF A01 CSCL 20/11

This report deals with the effect of initial imperfections on optimal stiffened cylinders under axial compression. A nonlinear stability methodology is developed for analyzing such system in the presence of small initial imperfections. This methodology is then employed to assess the effectiveness of stiffened cylinders optimized on the basis of linear stability analysis. GRA

N77-30518# George Washington Univ., Washington, D.C. School of Engineering and Applied Science.
THE NONLINEAR BIAXIAL EFFECTS ON ENERGY RELEASE RATE, J-INTEGRAL, AND STRESS INTENSITY FACTOR
James D. Lee and Harrold Liebowitz Mar. 1977 43 p refs
(Contract N00014-75-C-0946)
(AD-A039256) Avail: NTIS HC A03/MF A01 CSCL 20/11

A nonlinear finite element analysis is performed for a finite center-cracked specimen subjected to biaxial loading. A Ramberg-Osgood type stress-strain relation is used to characterize the material property. It is found that the energy release rate, J-integral, stress intensity factor, strain intensity factor depend not only on applied stress perpendicular to the crack but also on applied stress parallel to the crack. Biaxial effects on fracture toughness parameters increase as applied stress increases. The coupling between biaxial effects and material nonlinearity has been indicated. Author (GRA)

N77-30519# Lehigh Univ., Bethlehem, Pa. Center for the Application of Mathematics.
SOME RESEARCH DIRECTIONS IN FINITE ELASTICITY THEORY
R. S. Rivlin Apr. 1977 49 p refs Presented at the Euromech Colloq. 79, Darmstadt, West Germany, 7 - 10 Sep. 1976
(Contract N00014-76-C-0235)
(AD-A039681; CAM-100-26) Avail: NTIS HC A03/MF A01 CSCL 20/11

A number of topics in finite elasticity theory which appear to lend themselves to further development are briefly discussed. These include (1) the effect of kinematic constraints which are exactly, or approximately, satisfied; (2) the mechanics of elastic membranes; (3) the applicability of results in finite elasticity theory to problems involving stress relaxing materials; (4) the development of necessary and sufficient conditions for materials stability of isotropic elastic materials; and (5) the conditions for bifurcation solutions to exist in deformed elastic bodies. Author (GRA)

N77-30520# Illinois Univ., Urbana-Champaign. Dept. of Civil Engineering.
CONCRETE REINFORCED WITH PLAIN AND DEFORMED STEEL FIBERS Final Report, Dec. 1974 - Aug. 1976
Grant T. Halvorsen Aug. 1976 73 p refs
(Contract DOT-FR-30022)
(PB-267320/0; UILU-ENG-76-2011; DOT-TST-76T-20) Avail: NTIS HC A04/MF A01 CSCL 13C

Steel fiber reinforced concrete is studied as a material for slipformed tunnel liners. A comparison of the behavior of concretes reinforced with various types of steel fibers is useful in selecting mixes and equipment for concrete tunnel liners, and of general interest with respect to development of fibrous reinforcement with different anchorage characteristics. GRA

42 GEOSCIENCES (GENERAL)

N77-30521*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
TERRESTRIAL PHOTOVOLTAIC MEASUREMENTS, 2
1976 393 p refs Workshop held at Baton Rouge, La., 10-12 Nov. 1976; sponsored by NASA and ERDA
(NASA-CP-2010; ERDA/NASA-1022-76/10) Avail: NTIS HC A17/MF A01 CSCL 10A

The following major topics are discussed; (1) Terrestrial solar irradiance; (2) Solar simulation and reference cell calibration; and (3) Cell and array measurement procedures. Numerous related subtopics are also discussed within each major topic area. For individual titles, see N77-30522 through N77-30544.

N77-30522*# Energy Research and Development Administration, Washington, D.C. Div. of Solar Energy.
MONITORING SOLAR RADIATION: THE ERDA PROGRAM **c92**
Frederick A. Koomanoff and Michael R. Riches *In* NASA. Lewis Res. Center Terrest. Photovoltaic Meas., 2 1976 p 1-17 refs (For primary document see N77-30521 21-42)
Avail: NTIS HC A17/MF A01 CSCL 03B

An overview of the Energy Research and Development Administration planned insolation data network is described. The design of the network is predicated on an analysis and definition of user requirements. Research and analysis projects covering data collection, forecasting and extrapolation are presented.
Author

N77-30523*# Delaware Univ., Newark.
THE SOLAR SPECTRUM AT TYPICAL CLEAR WEATHER DAYS **c92**
K. W. Boer *In* NASA. Lewis Res. Center Terrest. Photovoltaic Meas., 2 1976 p 17-58 refs (For primary document see N77-30521 21-42)
Avail: NTIS HC A17/MF A01 CSCL 03B

The solar spectrum in the range of 300 is less than lambda is less than 1500nm is given for five typical clear weather days. These days are selected to represent typical seasonal conditions in respect to airmass water vapor, ozone, and turbidity. Present data are reviewed, and specific conditions are selected. The spectral distribution of the irradiance is given for the direct component, the scattered skylight, the total flux on a horizontal surface, and the flux on an inclined surface normal to the direct beam.
Author

N77-30524*# Delaware Univ., Newark. Inst. of Energy Conversion.
INSOLATION MEASUREMENTS WITH A PORTABLE CuS-CdS RADIOMETER **c92**
H. M. Windawi *In* NASA. Lewis Res. Center Terrest. Photovoltaic Meas., 2 1976 p 59-66 refs (For primary document see N77-30521 21-42)
(Grant NSF AER-72-03478)
Avail: NTIS HC A17/MF A01 CSCL 03B

Solar radiation measurements were carried out with a portable Cu2S-Cds radiometer. The measurements were found to be accurate to better than 5% (better than 3% when sophisticated metering is employed). Calibration to an Eppley precision pyranometer is discussed.
Author

N77-30525*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
TEST FACILITY FOR SOLAR-CELL REFERENCE CONDITIONS **c44**
Thomas M. Klucher *In its* Terrest. Photovoltaic Meas., 2 1976 p 67-78 refs Previously announced as N77-26618 (For primary document see N77-30521 21-42)
Avail: NTIS HC A17/MF A01 CSCL 10A
For abstract, see N77-26618.

N77-30526*# Sandia Labs., Albuquerque, N. Mex.
THE EFFECTS OF SPECTRAL VARIATIONS ON SILICON CELL OUTPUT **c44**
E. C. Boes and I. J. Hall *In* NASA. Lewis Res. Center Terrest. Photovoltaic Meas., 2 1976 p 79-92 Sponsored by ERDA (For primary document see N77-30521 21-42)
Avail: NTIS HC A17/MF A01 CSCL 10A

Spectral measurements of daily, total horizontal radiation were analyzed to determine the magnitude and character of the effects in silicon cell output. Data for different seasons and weather conditions are included. Techniques and results are described.
B.B.

N77-30527*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
THE EFFECT OF ATMOSPHERIC PARAMETERS ON SILICON CELL PERFORMANCE **c44**
Henry B. Curtis *In its* Terrest. Photovoltaic Meas., 2 1976 p 93-108 refs Previously announced as N77-26619 (For primary document see N77-30521 21-42)
Avail: NTIS HC A17/MF A01 CSCL 10A
For abstract, see N77-26619.

N77-30528*# Delaware Univ., Newark.
SOLAR EXCITATION OF CdS/Cu2S PHOTOVOLTAIC CELLS **c44**
K. W. Boer *In* NASA. Lewis Res. Center Terrest. Photovoltaic Meas., 2 1976 p 109-150 refs (For primary document see N77-30521 21-42)
Avail: NTIS HC A17/MF A01 CSCL 10A

Solar radiation of five typical clear weather days and under a variety of conditions is used to determine the spectral distribution of the photonflux at different planes of a CdS/Cu2S solar cell. The fractions of reflected and absorbed flux are determined at each of the relevant interfaces and active volume elements of the solar cell. The density of absorbed photons is given in respect to spectral and spatial distribution. The variance of the obtained distribution, with changes in insolation and absorption spectra of the active solar cell layers, is indicated. A catalog of typical examples is given in the appendix.
Author

N77-30529*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ERRORS IN SHORT CIRCUIT CURRENT MEASUREMENTS DUE TO SPECTRAL MISMATCH BETWEEN SUNLIGHT AND SOLAR SIMULATORS **c33**
Henry B. Curtis *In its* Terrest. Photovoltaic Meas., 2 1976 p 161-182 ref Previously announced as N77-26620 (For primary document see N77-30521 21-42)
Avail: NTIS HC A17/MF A01 CSCL 10A
For abstract, see N77-26620.

N77-30530*# Air Force Aero Propulsion Lab., Wright-Patterson AFB, Ohio.
A NEW RAPID METHOD OF SOLAR SIMULATOR CALIBRATION **c09**
Bernd Ross *In* NASA. Lewis Res. Center Terrest. Photovoltaic Meas., 2 1976 p 183-202 refs (For primary document see N77-30521 21-42)
(Contract F33615-76-C-2050)
Avail: NTIS HC A17/MF A01 CSCL 14B

A quick method for checking solar simulator spectra content is presented. The method is based upon a solar cell of extended spectral sensitivity and known absolute response, and a dichroic mirror with the reflection transmission transition close to the peak wavelength of the Thekaekara AMO distribution. It compromises the need for spectral discrimination with the ability to integrate wide spectral regions of the distribution which was considered important due to the spiky nature of the high pressure xenon lamp in common use. The results are expressed in terms of a single number, the blue/red ratio, which, combined with the total (unfiltered) output, provides a simple adequate characterization. Measurements were conducted at eleven major facilities across the country and a total of eighteen simulators were measured including five pulsed units.
Author

N77-30531*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
CONSIDERATION OF DESIGN AND CALIBRATION OF TERRESTRIAL REFERENCE SOLAR CELLS **c44**
V. G. Weizer *In its* Terrest. Photovoltaic Meas., 2 1976

p 203-222 refs Previously announced as N77-26621 (For primary document see N77-30521 21-42)
Avail: NTIS HC A17/MF A01 CSCL 10A
For abstract, see N77-26621.

N77-30532# National Bureau of Standards, Washington, D.C.
A LASER BASED CHARACTERIZATION FACILITY FOR SILICON PHOTOCELL STUDIES **c09**
Jon Geist, Michael A. Lind, A. Russell Schaefer, and Edward F. Zalewski *In* NASA. Lewis Res. Center Terrest. Photovoltaic Meas., 2 1976 p 223-232 refs (For primary document see N77-30521 21-42)
Avail: NTIS HC A17/MF A01 CSCL 14B
A computer controlled laser based characterization facility used for detailed studies of silicon photodetectors and spectral response measurement on silicon solar cell is described. The power in the laser beam is measured with respect to electrical standards using an electrically calibrated pyroelectric radiometer. B.B.

N77-30533*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
SOME BASIC CONSIDERATIONS OF MEASUREMENTS INVOLVING COLLIMATED DIRECT SUNLIGHT **c92**
An-Ti Chai *In its* Terrest. Photovoltaic Meas., 2 1976 p 233-246 refs Previously announced as N77-26622 (For primary document see N77-30521 21-42)
Avail: NTIS HC A17/MF A01 CSCL 03B
For abstract, see N77-26622.

N77-30534*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
SENSITIVITY OF SOLAR CELL PERFORMANCE TO ATMOSPHERIC VARIABLES. 1: SINGLE CELL **c44**
Thomas M. Klucher *In its* Terrest. Photovoltaic Meas., 2 1976 p 247-258 refs Previously announced as N77-26623 (For primary document see N77-30521 21-42)
Avail: NTIS HC A17/MF A01 CSCL 10A
For abstract, see N77-26623.

N77-30535*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
SENSITIVITY OF SOLAR-CELL PERFORMANCE TO ATMOSPHERIC VARIABLES. 2: DISSIMILAR CELLS AT SEVERAL LOCATIONS
Thomas M. Klucher and Russell E. Hart *In its* Terrest. Photovoltaic Meas., 2 1976 p 259-270 refs Previously announced as N77-26624 (For primary document see N77-30521 21-42)
Avail: NTIS HC A17/MF A01 CSCL 10A
For abstract, see N77-26624.

N77-30536*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
INTRODUCTION TO BASIC SOLAR CELL MEASUREMENTS **c44**
Henry W. Brandhorst, Jr. *In its* Terrest. Photovoltaic Meas., 2 1976 p 275-300 refs Previously announced as N77-26625 (For primary document see N77-30521 21-42)
Avail: NTIS HC A17/MF A01 CSCL 10A
For abstract, see N77-26625.

N77-30537*# Laboratoires d'Electronique et de Physique Appliquee, Paris Limeil-Brevannes (France).
CELL AND MODULE TEST PROCEDURES SEEN FROM THE MANUFACTURER AND THE USER POINT OF VIEW **c44**
Henry Durand *In* NASA. Lewis Res. Center Terrest. Photovoltaic Meas., 2 1976 p 301-308 (For primary document see N77-30521 21-42)
Avail: NTIS HC A17/MF A01 CSCL 10A
The problems encountered by manufacturers and users of solar modules are summarized. Related measurement of the rated power of the module is included, and a temperature test is suggested to define the actual performance of a module. Other suggestions are given for environmental module and array tests. B.B.

N77-30538*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
INDOOR AND OUTDOOR MEASUREMENTS OF PERFORMANCE OF PHOTOVOLTAIC ARRAYS **c44**
Henry B. Curtis *In its* Terrest. Photovoltaic Meas., 2 1976 p 309-322 refs Previously announced as N77-26626 (For primary document see N77-30521 21-42)
Avail: NTIS HC A17/MF A01 CSCL 10A
For abstract, see N77-26626.

N77-30539*# Royal Aircraft Establishment, Farnborough (England).
RECOMMENDATIONS FOR THE PERFORMANCE RATING OF FLAT PLATE TERRESTRIAL PHOTOVOLTAIC SOLAR PANELS **c44**
F. C. Treble *In* NASA. Lewis Res. Center Terrest. Photovoltaic Meas., 2 1976 p 323-336 refs (For primary document see N77-30521 21-42)
Avail: NTIS HC A17/MF A01 CSCL 10A
A review of recommendations for standardizing the performance rating of flat plate terrestrial solar panels is given to develop an international standard code of practice for performance rating. Required data to characterize the performance of a solar panel are listed. Other items discussed are: (1) basic measurement procedures; (2) performance measurement in natural sunlight and simulated sunlight; (3) standard solar cells; (4) the normal incidence method; (5) global method and (6) definition of peak power. B.B.

N77-30540*# Sandia Labs., Albuquerque, N. Mex.
SILICON SOLAR CELL TESTING IN CONCENTRATED SUNLIGHT AND SIMULATED SUNLIGHT **c44**
E. L. Burgess and K. W. Mitchell *In* NASA. Lewis Res. Center Terrest. Photovoltaic Meas., 2 1976 p 337-354 refs Sponsored by ERDA (For primary document see N77-30521 21-42)
Avail: NTIS HC A17/MF A01 CSCL 10A
A method is described for testing silicon solar cells in concentrated sunlight and simulated sunlight. Concentrated sunlight is obtained by using an acrylic Fresnel lens; the simulated sunlight source is a short arc Xenon lamp. Average illumination levels during the tests are inferred from an assumed linear relationship between short circuit current and illumination. The linearity assumption is investigated for 0.3 alpha cm base resistivity silicon cells and found to be valid. Some typical results are presented to illustrate the type of information obtained during the testing. Author

N77-30541*# Syracuse Univ., N. Y. Physical Electronics Lab.
ON THE DETERMINATION OF SERIES RESISTANCE AND DIODE QUALITY FACTOR OF SOLAR CELLS **c44**
R. L. Anderson *In* NASA. Lewis Res. Center Terrest. Photovoltaic Meas., 2 1976 p 347-354 refs (For primary document see N77-30521 21-42)
Avail: NTIS HC A17/MF A01 CSCL 10A
The series resistance and diode quality factor are used for evaluation of solar cell performance. These parameters are normally deduced from the terminal I-V characteristics under forward bias. The method produces a smaller series resistance and a larger value for diode quality factor than appropriate for the device when operating as a solar cell. It is suggested that the diode quality factor be determined from measured saturated photocurrent, open circuit voltage characteristics and the series resistance be measured with an r-f bridge or calculated from a measurement of the surface sheet resistance. Author

N77-30542*# Hitachi, Ltd., Tokyo (Japan). Central Research Lab.
PROBLEMS IN PHOTORESPONSE DISTRIBUTION MEASUREMENT **c44**
Shigekazzu Minagawa and Terunori Warabisako *In* NASA. Lewis Res. Center Terrest. Photovoltaic Meas., 2 1976 p 355-362 refs (For primary document see N77-30521 21-42)
Avail: NTIS HC A17/MF A01 CSCL 10A
Photoresponse distribution measurement by scanning a light spot across the surface of a semiconductor device is examined. The technqiue is used for solar cell characterization because the measured quantity is the direct expression of the distribution of

the desired performance of the device. An apparatus for measuring the photoresponse distribution was set and used in the development of polysilicon thin film solar cells. A schmeatic diagram of the apparatus and an example of measurement are shown. B.B.

N77-30543*# Joint Center for Graduate Study, Richland, Wash.
COLLECTION EFFICIENCY MEASUREMENTS FOR SOLAR CELL RESEARCH c44
Harry L. Hampton and Larry C. Olsen *In* NASA. Lewis Res. Center Terrest. Photovoltaic Meas., 2 1976 p 363-384 refs (For primary document see N77-30521 21-42)
(Grant NSF AER-75-20501)
Avail: NTIS HC A17/MF A01 CSCL 10A

A system was established for measuring absolute, spectral collection efficiency that is well suited to solar cell research and development. Determination of spectral collection efficiency involves measurements of the incident photon intensity, the device reflection coefficient, and the cell short circuit current. A monochromatic photon flux is obtained with a high intensity Bausch and Lomb monochromator, and an Epply thermopile detector is used to measure incident intensity. Normal incidence reflectivity measurements are achieved with a prism type beam splitter. The experimental approach is discussed, measurements of the reflectivity of evaporated silver films are considered. Collection efficiency measurements of silicon solar cells are presented, and collection efficiency studies of Cu20 solar cells are discussed. Author

N77-30544*# Delaware Univ., Newark. Inst. of Energy Conversion.
SPECTRAL RESPONSE MEASUREMENTS WITH WHITE LIGHT BIAS c44
W. Devaney, S. Lorenz, and J. D. Meakin *In* NASA. Lewis Res. Ceneter Terrest. Photovoltaic Meas., 2 1976 p 385-398 refs (For primary document see N77-30521 21-42)
(Contract E(49-18)-2538; Grant NSF AER-72-03478)
Avail: NTIS HC A17/MF A01 CSCL 10A

The spectral response of solar cells such as the CdS/Cu2S cell is non-linear with distinct quenching and enhancement bands. One possible technique to produce standardized solar efficiencies is to fold in spectral response with a standard solar spectrum. The spectral response of a cell was measured in a way which matched cell behavior under white light illumination. A technique was developed to measure the response of a cell to low intensity chopped monochromatic light while the cell is also illuminated with a white light bias corresponding to AMI. Author

43 EARTH RESOURCES

Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography.
For instrumentation see *35 Instrumentation and Photography*.

N77-30545 Maryland Univ., College Park.
THE VALUE OF LANDSAT DATA IN URBAN WATER RESOURCES PLANNING Ph.D. Thesis
Thomas Joseph Jackson 1976 251 p
Avail: Univ. Microfilms Order No. 77-10406

The economic value of LANDSAT multispectral satellite remote sensing in urban water resources planning was investigated. Parameters of the hydrologic simulation model STORM were related to the watershed percent of impervious area. Experiments were conducted to quantify the error encountered in estimating the percent of impervious area from LANDSAT data. The results indicate that errors are small when drainage areas of approximately two square miles or larger are involved. Dissert. Abstr.

N77-30546 Pennsylvania State Univ., University Park.
PROCEDURES FOR THE SYSTEMATIC EVALUATION OF REMOTE SENSOR PERFORMANCE AND QUANTITATIVE MISSION PLANNING Ph.D. Thesis
Lewis Edwin Link 1976 288 p
Avail: Univ. Microfilms Order No. 77-9569

Analytical models, that allow control of the variables that influence the imagery produced by photographic and thermal IR scanning sensor systems, were developed. Formulation from these models of simple tools for planning photographic and thermal IR remote sensing missions was made. Dissert. Abstr.

N77-30547 Pennsylvania State Univ., University Park.
BHATTACHARYYA DISTANCE AS A FEATURE SELECTION METHOD FOR MULTISPECTRAL DATA Ph.D. Thesis
Seon Jong Chung 1976 207 p
Avail: Univ. Microfilms Order No. 77-9539

A compact form expression of the Bhattacharyya distance function for the general case of K classes was derived and tested as a criterion for measure of separability among classes, and was used in the feature selection of the multidimensional remote sensing data. This expression was obtained from the definition of the Bhattacharyya coefficient by taking the integral of the product of all the probability density functions for K classes. The newly derived distance provides a more a compact and workable function formula for determining the Bhattacharyya distance in the K class case than the existing average form Bhattacharyya distance, and was shown to yield good results for future selection application to the multispectral digital data. Dissert. Abstr.

N77-30548*# Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.
[APPLICATIONS OF REMOTE SENSING, VOLUME 1] Final Technical Report, 1 Jun. 1976 - 31 May 1977
D. A. Landgrebe, Principal Investigator 31 May 1977 196 p Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. D. 57198 EREP
(Contract NAS9-14970)
(E77-10182; NASA-CR-151454) Avail: NTIS HC A09/MF A01 CSCL 05B

The author has identified the following significant results. ECHO successfully exploits the redundancy of states characteristics of sampled imagery of ground scenes to achieve better classification accuracy, reduce the number of classifications required, and reduce the variability of classification results. The information required to produce ECHO classifications are cell size, cell homogeneity, cell-to-field annexation parameters, input data, and a class conditional marginal density statistics deck.

N77-30549*# Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.
[APPLICATIONS OF REMOTE SENSING, VOLUME 3] Final Technical Report, 1 Jun. 1976 - 31 May 1977
D. A. Landgrebe, Principal Investigator 1977 78 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. D. 57198 EREP
(Contract NAS9-14970)
(E77-10185; NASA-CR-151452) Avail: NTIS HC A05/MF A01 CSCL 05B

The author has identified the following significant results. Of the four change detection techniques (post classification comparison, delta data, spectral/temporal, and layered spectral temporal), the post classification comparison was selected for further development. This was based upon test performances of the four change detection method, straightforwardness of the procedures, and the output products desired. A standardized modified, supervised classification procedure for analyzing the Texas coastal zone data was compiled. This procedure was developed in order that all quadrangles in the study area would be classified using similar analysis techniques to allow for meaningful comparisons and evaluations of the classifications.

N77-30550*# Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.
[APPLICATIONS OF REMOTE SENSING, VOLUME 2] Final Technical Report, 1 Jun. 1976 - 31 May 1977
D. A. Landgrebe, Principal Investigator 1977 93 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. D. 57198 EREP
(Contract NAS9-14970)
(E77-10186; NASA-CR-151453) Avail: NTIS HC A05/MF A01 CSCL 05B

The author has identified the following significant results.

The overall spectral response of the strata measured by a mean vector and covariance matrix for each stratum did not show differences among the LACIE phase 3 strata using the machine clustering procedures. This was expected since the large strata gave rise to broad normal distributions with a great deal of overlap. The static stratification of Kansas contains strata which are small in size. The distributions for these strata are not as broad as those based on the LACIE phase 3 partitions, but there is still some confusion since strata from different categories are not spectrally distinct.

N77-30551*# California Univ., Berkeley. Space Sciences Lab.

DETERMINING THE USEFULNESS OF REMOTE SENSING FOR ESTIMATING AGRICULTURAL WATER DEMAND IN CALIFORNIA Semiannual Report, 1 Jan. - 30 Jun. 1977

Robert N. Colwell, Principal Investigator 30 Jun. 1977 69 p refs Original contains color imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. D. 57198 ERTS

(Grant NsG-2207)

(E77-10191; NASA-CR-154258; SSL-Ser-18-Issue-59) Avail: NTIS HC A04/MF A01 CSCL 08H

The author has identified the following significant results. The manual interpretation phase designed to estimate the irrigated acreage of the Sacramento Valley is essentially complete. It was accomplished through the analysis of multidate LANDSAT color composite prints. A two sampling scheme using a sampling frame of clusters and stratification by agricultural practice and county boundary was designed to provide the data to calculate the multiphase estimate, variance, standard deviation, and relative error, as well as sample correlation coefficients for each county. Results have included individual date classifications into crop type and condition assiciated classes and summaries of the area of each type. These classes can be aggregated into estimates for irrigated versus nonirrigated acreage. A two date overlay study was also produced indicating ground and crop condition sequence, a product aimed at predicting total irrigated acreage, small grain and multicropped acreage.

N77-30552*# Food and Agriculture Organization of the United Nations, Rome (Italy).

THE APPLICATION OF ERTS IMAGERY TO THE FAO/UNESCO SOIL MAP OF THE WORLD Final Report

Raoul J. Dudal and Andre J. Pecrot, Principal Investigator 15 May 1977 5 p Sponsored by NASA ERTS

(E77-10192; NASA-CR-154261) Avail: NTIS HC A02/MF A01 CSCL 08M

The author has identified the following significant results. It was concluded that direct identification and mapping of the various soil degradation forms and intensities from the color composite imagery was generally difficult, if not impossible. The imagery, however, provided valuable information on some main environmental criteria which could be used in connection with other available field data to assess actual soil degradation and estimate soil degradation hazards.

N77-30553*# Geological Survey, Reston, Va.

OVERALL EVALUATION OF LANDSAT (ERTS) FOLLOW ON IMAGERY FOR CARTOGRAPHIC APPLICATION Progress Report, 1 Apr. 1976 - 1 Jul. 1977

Alden P. Colvocoresses, Principal Investigator 1 Jul. 1977 18 p refs ERTS

(NASA Order S-543-47A)

(E77-10193; NASA-CR-154262) Avail: NTIS HC A02/MF A01 CSCL 08B

The author has identified the following significant results. LANDSAT imagery can be operationally applied to the revision of nautical charts. The imagery depicts shallow seas in a form that permits accurate planimetric image mapping of features to 20 meters of depth where the conditions of water clarity and bottom reflection are suitable. LANDSAT data also provide an excellent simulation of the earth's surface, for such applications as aeronautical charting and radar image correlation in aircraft and aircraft simulators. Radiometric enhancement, particularly edge enhancement, a technique only marginally successful with aerial photographs has proved to be high value when applied to LANDSAT data.

N77-30554*# California State Dept. of Water Resources, Sacramento.

MONITORING WATER QUALITY BY REMOTE SENSING Final Report, Jun. 1975 - Mar. 1977

Randall L. Brown, Principal Investigator Jul. 1977 58 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. D. 57198 ERTS

(Contract NAS5-20945)

(E77-10194; NASA-CR-154259) Avail: NTIS HC A04/MF A01 CSCL 08H

The author has identified the following significant results. A limited study was conducted to determine the applicability of remote sensing for evaluating water quality conditions in the San Francisco Bay and delta. Considerable supporting data were available for the study area from other than overflight sources, but short-term temporal and spatial variability precluded their use. The study results were not sufficient to shed much light on the subject, but it did appear that, with the present state of the art in image analysis and the large amount of ground thruth needed, remote sensing has only limited application in monitoring water quality.

N77-30555*# Science Applications, Inc., La Jolla, Calif.

DETERMINATION OF AEROSOL CONTENT IN THE ATMOSPHERE FROM LANDSAT DATA Progress Report, 1 Feb. - 24 Jul. 1977

M. Griggs, Principal Investigator 25 Jul. 1977 11 p ref ERTS

(Contract NAS5-20899)

(E77-10195; NASA-CR-154260; SAI-77-793-LJ; PR-9; PR-10) Avail: NTIS HC A02/MF A01 CSCL 04A

There are no author-identified significant results in this report.

N77-30556*# Geological Survey, Reston, Va.

LAND USE MAPPING AND MODELLING FOR THE PHOENIX QUADRANGLE Progress Report, 1 Jul. 1972 - 19 Apr. 1974

John L. Place, Principal Investigator 19 Jun. 1974 34 p refs Original contains color imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. D. 57198 ERTS

(NASA Order S-70243-AG)

(E77-10196; NASA-CR-154263) Avail: NTIS HC A03/MF A01 CSCL 08B

The author has identified the following significant results. The mapping of generalized land use (level 1) from ERTS 1 images was shown to be feasible with better than 95% accuracy in the Phoenix quadrangle. The accuracy of level 2 mapping in urban areas is still a problem. Updating existing maps also proved to be feasible, especially in water categories and agricultural uses; however, expanding urban growth has presented with accuracy. ERTS 1 film images indicated where areas of change were occurring, thus aiding focusing-in for more detailed investigation. ERTS color composite transparencies provided a cost effective source of information for land use mapping of very large regions at small map scales.

N77-30557*# Geological Survey, Miami, Fla. Water Resources Div.

WATER-MANAGEMENT MODELS IN FLORIDA FROM ERTS-1 DATA Final Report

A. L. Higer, Principal Investigator, R. H. Rogers, A. E. Coker, and E. H. Cordes (Bendix Aerospace Systems Div., Ann Arbor) Feb. 1975 44 p Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS

(NASA Order S-70243-AG)

(E77-10197; NASA-CR-154264) Avail: NTIS HC A03/MF A01 CSCL 08H

The author has identified the following significant results. The usefullness of ERTS 1 to improving the overall effectiveness of collecting and disseminating data was evaluated. ERTS MSS imagery and in situ monitoring by DCS were used to evaluate their separate and combined capabilities. Twenty data collection platforms were established in southern Florida. Water level and rainfall measurements were collected and disseminated to users in less than 2 hours, a significant improvement over conventional

techniques requiring 2 months. ERTS imagery was found to significantly enhance the utility of ground measurements. Water stage was correlated with water surface areas from imagery in order to obtain water stage-volume relations. Imagery provided an economical basis for extrapolating water parameters from the point samples to unsampled data and provided a synoptic view of water mass boundaries that no amount of ground sampling or monitoring could provide.

N77-30558*# Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.
ERTS MULTISPECTRAL IMAGE TRANSFORMATIONS FOR GEOLOGICAL LINEAMENT ENHANCEMENT
Paul E. Anuta, Principal Investigator and Bijan Mobasseri 25 Feb. 1975 22 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. D. 57198 EREP
(Contract NAS9-14016; Grant NGL-15-005-112)
(E77-10198; NASA-CR-151468; LARS-Inform-Note-022575) Avail: NTIS HC A02/MF A01 CSCL 08G
There are no author-identified significant results in this report.

N77-30559*# Atomic Energy Commission, Dacca (Bangladesh).
INVESTIGATIONS USING DATA FROM LANDSAT-2 Quarterly Report, Apr. - Jun. 1977
Anwar Hossain, Principal Investigator Jul. 1977 7 p refs Sponsored by NASA ERTS
(E77-10199; NASA-CR-154265) Avail: NTIS HC A02/MF A01 CSCL 05B
There are no author-identified significant results in this report.

N77-30560*# Guelph Univ. (Ontario).
LANDSAT/BANGLADESH PROJECT
Richard Protz and A. Hossain, Principal Investigators 17 May 1977 12 p refs Sponsored by NASA ERTS
(E77-10200; NASA-CR-154266) Avail: NTIS HC A03/MF A01 CSCL 05B
There are no author-identified significant results in this report.

N77-30561*# Atomic Energy Commission, Dacca (Bangladesh).
REMOTE SENSING AND SATELLITE SURVEYING IN BANGLADESH: A BACKGROUND PAPER ON THE LATEST POSITION OF THE STATUS OF REMOTE SENSING AND SATELLITE SURVEYING IN BANGLADESH
Anwar Hossain, Principal Investigator 1977 6 p Sponsored by NASA ERTS
(E77-10201; NASA-CR-154267) Avail: NTIS HC A02/MF A01 CSCL 05B
There are no author-identified significant results in this report.

N77-30562*# Atomic Energy Commission, Dacca (Bangladesh).
ESCAP INTER-GOVERNMENTAL MEETING ON REMOTE SENSING AND SATELLITE SURVEYING
Anwar Hossain, Principal Investigator 1977 40 p Meeting held at Bangkok, 7-13 Jun. 1977 Sponsored by NASA ERTS
(E77-10202; NASA-CR-154268) Avail: NTIS HC A03/MF A01 CSCL 05B
There are no author-identified significant results in this report.

N77-30563*# Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.
EVALUATION OF CHANGE DETECTION TECHNIQUES FOR MONITORING COASTAL ZONE ENVIRONMENTS
R. A. Weismiller, Principal Investigator, S. J. Kristof, D. K. Scholz, P. E. Anuta, and S. M. Momin 22 Jun. 1977 24 p refs EREP
(Contract NAS9-14016)
(E77-10203; NASA-CR-151482; LARS-Inform-Note-062277) Avail: NTIS HC A02/MF A01 CSCL 08J
The author has identified the following significant results. Four change detection techniques were designed and implemented for evaluation: (1) post classification comparison change detection, (2) delta data change detection, (3) spectral/temporal change classification, and (4) layered spectral/temporal change classification. The post classification comparison technique reliably identified areas of change and was used as the standard for qualitatively evaluating the other three techniques. The layered spectral/temporal change classification and the delta data change detection results generally agreed with the post classification comparison technique results; however, many small areas of change were not identified. Major discrepanicies existed between the post classification comparison and spectral/temporal change detection results.

N77-30564*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
THE LARGE AREA CROP INVENTORY EXPERIMENT: AN EXPERIMENT TO DEMONSTRATE HOW SPACE-AGE TECHNOLOGY CAN CONTRIBUTE TO SOLVING CRITICAL PROBLEMS HERE ON EARTH
Aug. 1977 16 p ref
(NASA-TM-74832; JSC-11854) Avail: NTIS HC A02/MF A01 CSCL 02C
The large area crop inventory experiment is being developed to predict crop production through satellite photographs. This experiment demonstrates how space age technology can contribute to solving practical problems of agriculture management. Author

N77-30565*# Missouri Dept. of Natural Resources, Rolla.
REMOTE SENSING APPLICATIONS TO MISSOURI ENVIRONMENTAL RESOURCES INFORMATION SYSTEM Annual Report, 15 Jan. 1976 - 15 Jan. 1977
Robert E. Myers 15 Jan. 1977 85 p
(Contract NAS8-31766)
(NASA-CR-150340) Avail: NTIS HC A05/MF A01 CSCL 08F
An efficient system for retrieval of remotely sensed data to be used by natural resources oriented agencies, and a natural resources data system that can meet the needs of state agencies were studied. To accomplish these objectives, natural resources data sources were identified, and study of systems already in operation which address themselves to the more efficient utilization of natural resources oriented data was prepared. Author

N77-30566*# Missouri Univ., Rolla. Dept. of Minerals, Petroleum and Geological Engineering.
APPLICATION TRANSFER ACTIVITY IN MISSOURI Annual Progress Report, 5 Jan. 1976 - 5 Jan. 1977
David J. Barr Jan. 1977 74 p refs Original contains color illustrations
(Contract NAS8-31767)
(NASA-CR-150341) Avail: NTIS HC A04/MF A01 CSCL 05B
Land use mapping of Missouri from LANDSAT imagery was investigated. Land resource classification included the inventory of mined land, accomplished with infrared aerial photography, plus topographic, geologic and hydrologic maps. B.L.P.

N77-30567*# Arizona Univ., Tucson. Office of Arid Lands Studies.
APPLIED REMOTE SENSING PROGRAM (ARSP) Annual Report, FY 1976 - 1977
David A. Mouat, Jack D. Johnson, and Kenneth E. Foster Jun. 1977 56 p refs
(Grant NGL-03-002-313)
(NASA-CR-153413; OALS-Bull-15; AR-5) Avail: NTIS HC A04/MF A01 CSCL 05B
Descriptions of projects engaged by the Applied Remote Sensors Program in the state of Arizona are contained in an annual report for the fiscal year 1976-1977. Remote sensing techniques included thermal infrared imagery in analog and digital form and conversion of data into thermograms. Delineation of geologic areas, surveys of vegetation and inventory of resources were also presented. B.L.P.

N77-30568*# South Dakota State Univ., Brookings. Remote Sensing Institute.
INVENTORY OF WETLAND HABITAT USING REMOTE SENSING FOR THE PROPOSED OAHE IRRIGATION UNIT IN EASTERN SOUTH DAKOTA

Robert G. Best, Donald G. Moore, and Victor I. Myers [1977] 40 p refs
(Grant NGL-42-003-007)
(NASA-CR-153412) Avail: NTIS HC A03/MF A01 CSCL 08H

An inventory of wetlands for the area included in the proposed Oahe irrigation project was conducted to provide supplemental data for the wildlife mitigation plan. Interpretation techniques for inventoring small wetlands in the low relief terrain of the Lake Dakota Plain were documented and data summaries included. The data were stored and tabulated in a computerized spatial data analysis system. Author

N77-30569*# Arkansas Univ., Pine Bluff.
IDENTIFICATION OF CROPS IN CENTRAL ARKANSAS USING VISUAL AND INFRARED SPECTRAL REFLECTANCE SIGNATURES
1977 12 p Revised
(Grant NsG-9002)
(NASA-CR-151495) Avail: NTIS HC A02/MF A01 CSCL 02C

The spectral reflectance signatures of principle crops of central Arkansas were calibrated. Data were collected by conducting ground based reflectance signatures at well controlled test sites. Data collected were primarily for soybeans, therefore, additional measurements are essential to the acquisition of significant results. Author

N77-30570*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
THE LARGE AREA CROP INVENTORY EXPERIMENT: A MAJOR DEMONSTRATION OF SPACE REMOTE SENSING
R. B. MacDonald and F. G. Hall Jun. 1977 49 p refs Presented at W. Nordberg Mem. Symp. on Contrib. of Space Observ. to Global Food Inform. Systems, Tel-Aviv, Israel, 8-10 Jun. 1977; Sponsored by COSPAR/IAMP (IUGG), FAO and WMO
(NASA-TM-74840; COSPAR-D.2.3) Avail: NTIS CSCL 02C

Strategies are presented in agricultural technology to increase the resistance of crops to a wider range of meteorological conditions in order to reduce year-to-year variations in crop production. Uncertainties in agricultral production, together with the consumer demands of an increasing world population, have greatly intensified the need for early and accurate annual global crop production forecasts. These forecasts must predict fluctuation with an accuracy, timeliness and known reliability sufficient to permit necessary social and economic adjustments, with as much advance warning as possible. Author

N77-30571*# California Univ., Santa Barbara. Dept. of Geography.
REMOTE SENSING APPLICATIONS TO HYDROLOGIC MODELING Semiannual Report
Jeff Dozier, John E. Estes, David S. Simonett, Robert Davis, James Frew, Danny Marks, Karl Schiffman, Mary Souza, and Ellen Witebsky Sep. 1977 27 p refs
(Grant NsG-5155)
(NASA-CR-154842) Avail: NTIS HC A03/MF A01 CSCL 08H

An energy balance snowmelt model for rugged terrain was devised and coupled to a flow model. A literature review of remote sensing applications to hydrologic modeling was included along with a software development outline. Author

N77-30572*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
A PROCEDURE FOR DETECTION AND MEASUREMENT OF INTERFACES IN REMOTELY ACQUIRED DATA USING A DIGITAL COMPUTER
Kenneth H. Faller (NASA Earth Resources Lab., Slidell, La.) Jul. 1977 32 p refs Original contains color illustrations
(NASA-TR-R-472; JSC-S-467) Avail: NTIS HC A03/MF A01 CSCL 05B

A technique developed and evaluated for the detection and measurement of surface feature interfaces in remotely acquired data is described. A computer implementation of this technique has been effected to automatically process categorized data derived from various sources such as the LANDSAT multispectral scanner and other scanner type sensors. The basic elements of the operational theory of the technique are described together with details of the procedure. An example application of the technique to the analysis of tidal shoreline length is given with a breakdown of manpower requirements. Author

N77-30573*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
LACIE: A LOOK TO THE FUTURE
R. B. MacDonald and F. G. Hall Apr. 1977 38 p refs Presented to the 11th Intern. Symp. of Remote Sensing of Environment, Ann Arbor, Mich., 25-29 Apr. 1977
(NASA-CR-153410; JSC-11685) Avail: NTIS HC A03/MF A01 CSCL 05B

The applicability of remote sensing technology to monitor globally an important world food crop - wheat - is demonstrated. The experiment's approach to production monitoring is described briefly, and its status is reviewed as of the conclusion of 2 years of successful operation. Examples of acreage and yield monitoring in the Soviet Union are used to illustrate the experiment's approach. Author

N77-30574*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
LACIE: WHEAT YIELD MODELS FOR THE USSR
Clarence M. Sakamoto (Center for Climatic and Environmental Assessment, Columbia, Mo.) and Sharon K. LeDuc (Center for Climatic and Environmental Assessment, Columbia, Mo.) Jun. 1977 55 p refs
(NASA-TM-74834; JSC-11343; LACIE-00430-Rev-A; TN-77-2) Avail: NTIS HC A04/MF A01 CSCL 02C

A quantitative model determining the relationship between weather conditions and wheat yield in the U.S.S.R. was studied to provide early reliable forecasts on the size of the U.S.S.R. wheat harvest. Separate models are developed for spring wheat and for winter. Differences in yield potential and responses to stress conditions and cultural improvements necessitate models for each class. Author

N77-30575*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
LACIE: YIELD-WEATHER REGRESSION MODELS FOR THE CANADIAN PRAIRIES
Feb. 1976 26 p refs Sponsored in part by USDA Prepared in cooperation with NOAA
(NASA-TM-74833; LACIE-00433; JSC-11658) Avail: NTIS HC A03/MF A01 CSCL 02C

Most of the variability in wheat production is due to weather fluctuations. Climatic differences within the region account for a large portion of the variability in yields for different parts of the region. Separate regression models were developed for each of the areas indicated. Author

N77-30576*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
LACIE: WHEAT YIELD MODELS FOR THE UNITED STATES, REVISION A
Jun. 1977 23 p Sponsored in part by USDA Prepared in cooperation with NOAA
(NASA-TM-74835; LACIE-00431-Rev-A; JSC-11656) Avail: NTIS HC A02/MF A01 CSCL 02C

Crop/weather models for wheat have been developed for the Great Plains region of the United States. The enclosed maps indicate the areal coverage of the various models for spring (durum and other spring) and winter wheat. The given regions are the combination of several climatic divisions and many times comprise an entire state. Author

N77-30577*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
LAND USE/LAND COVER MAPPING (1:25000) OF TAIWAN, REPUBLIC OF CHINA BY AUTOMATED MULTISPECTRAL INTERPRETATION OF LANDSAT IMAGERY
Quo-Cheng Sung and Lee D. Miller Aug. 1977 182 p refs Submitted for publication
(NASA-TM-X-71382; X-923-77-210) Avail: NTIS HC A09/MF A01 CSCL 08B

Three methods were tested for collection of the training sets needed to establish the spectral signatures of the land

uses/land covers sought due to the difficulties of retrospective collection of representative ground control data. Computer preprocessing techniques applied to the digital images to improve the final classification results were geometric corrections, spectral band or image ratioing and statistical cleaning of the representative training sets. A minimal level of statistical verification was made based upon the comparisons between the airphoto estimates and the classification results. The verifications provided a further support to the selection of MSS band 5 and 7. It also indicated that the maximum likelihood ratioing technique can achieve more agreeable classification results with the airphoto estimates than the stepwise discriminant analysis. Author

N77-30578# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

USEFULLNESS OF THE LANDSAT 1 DATA IN THE IMPLEMENTATION, CONTROL, AND MONITORING OF THE CATTLE FARM PROJECTS IN THE SOUTHEASTERN AMAZON REGION M.S. Thesis

Armando Pacheco DosSantos and Evlyn Marcia Leao DeMoraes Novo Jun. 1977 228 p refs In PORTUGUESE; ENGLISH summary

(INPE-1044-TPT/056) Avail: NTIS HC A11/MF A01

LANDSAT images were used to evaluate the natural resources of the Amazon region. Vegetation, drainage, topographic conditions road systems, and deforestation were considered. Deforested areas were mapped and the quality of pasture lands determined, in order to find suitable areas for cattle. Results show that LANDSAT images can be used very efficiently to map different kinds of natural vegetation, forested drainage networks, topographic conditions and road networks. Areas being deforested were successfully monitored and evaluated. Author

N77-30579# Air Force Academy, Colo.

DETERMINATION OF TRUE ELEVATIONS FROM AERIAL PHOTOGRAPHS Final Report

Charles L. Smith Mar. 1977 29 p refs

(AD-A039356; USAFA-TR-77-3) Avail: NTIS HC A03/MF A01 CSCL 14/5

There are many problems involved in the determination of accurate elevations from tilted photographs. Plotting machines such as the Wild A-7 are able to compensate for tilt and provide accurate elevations, however, these machines are expensive and not available to many researchers. This report describes a set of procedures and a computer program for the determination of ground elevations to the same general degree of accuracy as that obtained with plotting machines. The procedures involve parallax measurements and location of points within a stereoscopic model. Author (GRA)

N77-30580# Army Cold Regions Research and Engineering Lab., Hanover, N. H.

APPARENT ANOMALY IN FREEZING OF ORDINARY WATER

George K. Swinzow Jun. 1976 31 p refs

(AD-A039177; CRREL-76-20) Avail: NTIS HC A03/MF A01 CSCL 20/13

Under ordinary conditions, the freezing of water begins with supercooling and ice nucleation, and proceeds at 0 C at the ice/water interface until ice formation stops. The presence of solutes, high pressure, or dispersal in fine pores causes the water to freeze at temperatures below 0 C (the so-called freezing point depression). Whenever freezing begins, it proceeds at a constant temperature, or at a temperature which becomes progressively lower. A temperature rise during ice formation is considered here to be an anomaly. Under all equal circumstances, the conditions under which an anomalous freezing temperature is observable appear to be very special. This report describes two different experiments displaying the anomalous rise of temperature after nucleation and during ice formation. In one case the water was dispersed in the fine pores of fine powders; in the other case pure water was frozen in a transparent insulated cell. Photographic observations were made; relations of ice surface to water volume were measured. Author (GRA)

N77-30581# Army Cold Regions Research and Engineering Lab., Hanover, N. H.

REMOTE SENSING OF ACCUMULATED FRAZIL AND BRASH ICE IN THE ST. LAWRENCE RIVER

Arnold M. Dean, Jr. Apr. 1977 26 p refs

(AD-A039905; CRREL-77-8) Avail: NTIS HC A03/MF A01 CSCL 08/12

A broadbanded impulse radar system was used for aerial detection of accumulated frazil and brash ice in a 9.5-km reach of the St. Lawrence River near Ogden Island. The remote sensing and data reduction system developed for the project provided data sufficient for production of a contour map having 1-ft intervals. With this contour map, the accumulation pattern of frazil and brash ice could be analyzed. Recommendations are given for improving the performance of the aerial profiling system.

Author (GRA)

N77-30582# Boeing Aerospace Co., Seattle, Wash.

STEREO ACUITY AND RECONNAISSANCE. PHASE 1: DEVELOPMENT OF PRECISION CHROMOSTEREOPSIS TEST AND TEST EQUIPMENT Final Report, Nov. 1973 - Dec. 1974

Charles D. Anderson and Conrad L. Kraft Wright-Patterson AFB, Ohio AFML Mar. 1977 71 p refs

(Contract F33615-74-C-4037)

(AD-A040450; AMRL-TR-76-112) Avail: NTIS HC A04/MF A01 CSCL 17/8

A long focal length Badal optometer with a three-axis head positioner was designed, developed and used in investigations dealing with stereoscopic acuity and reconnaissance. The major effort was in the development of a precision chromostereopsis test, a short version of this same test and a foveal/parafoveal scan test. The Badal optometer provided the desired precision in the measurement of intervisual axes distance, interpupillary distance and interocular reflection distance with no convergence of the eyes and with specific accommodative distances. The more precise location of the intervisual axes distance was used to study the effect of decentered artificial and natural pupils. Decentering of 2 mm artificial pupils from the observer's intervisual axes distance modified the relative perceived distance of colored but not of achromatic stimuli. The direction but not the magnitude of the effect agreed with prior investigators. The natural pupil data were inconclusive in its support of decentration of the pupil or Stiles-Crawford maxima as a complete explanation for chromostereopsis. The precision (ARC) chromostereopsis test was found to be easy to administer and reliable, and resulted in chromostereopsis measurements ranging from 5 to 130 seconds of arc. Prediction of the effect of an individual's chromostereopsis on his stereoscopic performance with chromatic imagery was accurate to within + or - 5.5 arc seconds 68% of the time.

GRA

N77-30583# Army Engineer Topographic Labs., Fort Belvoir, Va.

THE USE OF ARRAY ALGEBRA IN TERRAIN MODELING PROCEDURES

Ronald L. Magee Oct. 1976 83 p refs

(AD-A040619; ETL-0094) Avail: NTIS HC A05/MF A01 CSCL 08/6

Array algebra, a new technique that finds the least-squares fit of a model equation to a set of ordered data, is investigated as a possible replacement for the current conventional least-squares polynomial-fitting technique. Both techniques are described and analyzed within the context of their applicability to current terrain modeling procedures and are compared for computational efficiency. This analysis specifically considers increasing the number of model polynomial terms (up to 256 terms) and discusses the impact of array algebra upon future R and D activities involving these high order polynomials.

Author (GRA)

N77-30584# Geological Survey, Iowa City, Iowa. Water Resources Div.

WATER RESOURCES DATA FOR IOWA. WATER YEAR 1976 Annual Water Data Report, 1 Oct. 1975 - 30 Sep. 1976

Apr. 1977 329 p

(PB-266992/7; USGS/WRD/HD-77/016; USGS/WDR/IA-76/1) Avail: NTIS HC A15/MF A01 CSCL 08H

Water resources data for the 1976 water year for Iowa

consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels in wells. Discharge records for gaging stations; stage and contents for lakes and reservoirs; water quality for gaging stations; and water levels for observation wells are reported. Also included are crest stage partial record stations, low flow partial record stations, and water quality partial record stations. GRA

N77-30585# Illinois Univ., Urbana-Champaign.
CYCLING OF DISSOLVED ORGANIC PHOSPHORUS COMPOUNDS IN NATURAL WATERS Final Report
Herbert E. Allen, Thomas D. Brisbin, and Kurt O. Thomsen Mar. 1977 27 p refs
(Contract DI-14-31-0001-6014)
(PB-267105/5; UILU-WRC-77-0120; W77-07608; OWRT-A-078-ILL(1)) Avail: NTIS HC A03/MF A01 CSCL 08H

Characterization of soluble phosphorus by enzymatic assays was conducted to determine if protease and/or lipase in conjunction with phytase or alkaline phosphatase would promote the remineralization of organic phosphorus. Results of a study to determine which enzymes are factors to be considered in the phosphorus cycle are presented. GRA

N77-30586# International Geographical Union Commission on Geographical Data Sensing and Processing.
DIGITAL GEOGRAPHIC DATA HANDLING ACTIVITIES IN THE U.S. GEOLOGICAL SURVEY Interim Report
Mar. 1976 374 p refs
(Grant DI-14-08-0001-G-215)
(PB-266663/4) Avail: NTIS HC A16/MF A01 CSCL 08F

Computer applications involving geographical data are presented. The descriptive elements include system name, contact, division, branch, objective, method, data manipulation, geographic reference, data volume, products and outputs, and state of development. Two tables summarize the system descriptions and the data volumes. GRA

N77-30587# Arizona Water Resources Research Center, Tucson.
RAINFALL INFILTRATION CHARACTERISTICS FOR A SEMI-ARID WATERSHED SOIL M.S. Thesis
John Gray Morse 1976 86 p refs
(Contract DI-14-31-0001-3503)
(PB-267723/5; W77-08206; OWRT-A-027-ARIZ(1)) Avail: NTIS HC A05/MF A01 CSCL 08M

Rainfall infiltration characteristics for a semi-arid watershed soil were studied. The soil examined was obtained from Page Ranch, 25 miles north of Tucson, AZ. Laboratory infiltration tests were conducted on reconstructed soil profiles similar to those on the watershed. A mathematical model of infiltration was used to simulate the infiltration process. Results from infiltration tests conducted on site at the watershed during a previous research study were also simulated using the infiltration model. Laboratory and field infiltration tests were conducted using a realistic rotating disk rainfall simulator. Single- and dual-source gamma ray attenuation techniques were used to obtain soil moisture measurements within the laboratory soil profiles. By changing the saturated conductivity of the upper soil layer, it was also possible to simulate the infiltration process on a grass-covered plot. GRA

N77-30588# Bureau of Mines, Denver, Colo.
REMOTE TRANSDUCER BASED ON COHERENT MIXING OF BACKSCATTERED LASER LIGHT
Robert A. Bruce 1977 19 p refs
(PB-266771/5; BM-RI-8220) Avail: NTIS HC A02/MF A01 CSCL 14B

A motion transducer based on coherent mixing of laser light backscattered from rough surfaces is evaluated in terms of sensitivity, bandwidth and range. Tests made with a prototype composed of a 4-mw HeNe laser, a silicon avalanche photodiode, and a 15cm aperture telescope demonstrate that remote measurements with reasonable bandwidth and accuracy are feasible at distances up to 100 meters. GRA

N77-30589# Bureau of Mines, Pittsburgh, Pa. Mining and Safety Research Center.
METHODS OF DETERMINING THE ORIENTATIONS OF BEDROCK FRACTURE SYSTEMS IN SOUTHWESTERN PENNSYLVANIA AND NORTHERN WEST VIRGINIA
B. M. Bench, W. P. Diamond, and C. M. McCulloch 1977 52 p refs
(PB-266769/9; BM-RI-8217) Avail: NTIS HC A04/MF A01 CSCL 08I

Photolineaments from stereoscopic examination of vertical aerial photographs, and those found by the Ronchi grating study of aerial photoindex sheets are described and discussed. They are compared with the trends of oriented fracture systems procured by measuring the compass direction of joints in bedrock. The relative reliability of the methods is shown, and the results are presented in graphical, tabular, and written form. Analyses of field measurements of strikes of bedrock joints in the project area indicate for the most part two intersecting sets of major joints oriented N 76 degrees W - N 15 degrees E, and N 57 degrees W - N 27 degrees E. The analyses of lineaments determined by stereoscopic examination of aerial photographs show dominant trends of lineament zones of weakness to be an average on N 65 degrees W - N 20 degrees E. Analysis of lineaments found by Ronchi grid viewing of aerial photoindex sheets indicate dominant trends of N 70 degrees W - N 27 degrees E. GRA

N77-30590# National Academy of Sciences - National Research Council, Washington, D. C. Board on Science and Technology for International Development.
RESOURCE SENSING FROM SPACE: PROSPECTS FOR DEVELOPING COUNTRIES Final Report
Mar. 1977 210 p refs
(Contract AID/CSD-2584)
(PB-264171/0; IR/BOSTID-77/23) Avail: NTIS HC A10/MF A01 CSCL 08F

Current and prospective applications of interest to the developing countries, implications for long-term governance of a remote sensing system, and desirable technical cooperation initiatives are examined. GRA

N77-30591# Environmental Research and Technology, Inc., Concord, Mass.
STUDY OF NEAR-INFRARED SNOW REFLECTANCE USING SKYLAB S192 MULTISPECTRAL SCANNER DATA Final Report
James C. Barnes and Clinton J. Bowley Mar. 1977 54 p refs
(Contract NOAA-6-35201)
(PB-267504/9; ERT-1474-F) Avail: NTIS HC A04/MF A01 CSCL 08L

Digital tape data (computer compatible tapes) from the Skylab S192 multispectral scanner are analyzed to examine further the characteristics of snow reflectance in the near infrared portion of the spectrum. The tapes used in the study are from four Skylab passes crossing mountainous terrain in the western United States, three in the late spring from the Skylab-4 mission and one in the late spring from the Skylab-2 mission. In each case the snow conditions are assessed through interpretation of the accompanying Skylab photography, snow reports and meteorological data. The results of the investigation show that the reflectance over a uniform snowpack is significantly lower in the near infrared than in the visible or red infrared portions of the spectrum. GRA

N77-30592*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
LANDSAT: US STANDARD CATALOG, 1-31 MAY 1977
31 May 1977 82 p
(NASA-TM-74859; GSFC/LU-C/005; NTISUB/C/138-005) Avail: NTIS HC A05/MF A01 CSCL 05B

The catalog lists U.S. imagery acquired by LANDSAT 1 and 2 which has been processed and put in to the data files during May, 77. Data, such as date acquired, cloud cover and image quality are given for each scene. The microfilm roll and frame on which the scene may be found is also given. Author

N77-30593# Purdue Univ., Lafayette, Ind. Inst. for Research in the Behavioral, Economic, and Management Sciences.
IMPLEMENTATION OF A DECISION SUPPORT FOR REGIONAL WATER QUALITY PLANNING

R. C. Bonczek, C. W. Holsapple, and A. B. Whinston Oct. 1976 43 p refs
(Contract DI-14-34-0001-6076)
(PB-267342/4; Paper-570; W77-07812; OWRT-B-080-IND(4)) Avail: NTIS HC A03/MF A01 CSCL 13B

The Generalized Planning System is presented as a framework for the implementation of decision support systems concerned with any of a broad variety of decision applications. The particular application treated here relates to regional water quality planning. The principal considerations are a data base facility that accommodates information in a semantic network, a technique for model formulation, and the automatic interfacing of data with models by means of an non-procedural mapping language. GRA

N77-30594# Minnesota Univ., Minneapolis. Water Resources Research Center.
WATER QUALITY STATUS AND TRENDS IN MINNESOTA: INDICES FOR WATER SUPPLY AND GROUND WATER POLLUTION Completion Report
Conrad P. Straub, Velta M. Goppers, and Alain DuChene Oct. 1976 209 p refs Supported by OWRT
(PB-267331/7; W77-07794; OWRT-A-029-MINN(2)) Avail: NTIS HC A10/MF A01 CSCL 13B

Information presented includes an up-to-date summary of facts covering ownership, pumpage, source, installation, treatment, storage, chemical quality for public water suppliers in the State of Minnesota. The chemical analysis data included: date of sample, total hardness (as CaCO3), alkalinity (as CaCO3), calcium (as CaCO3), pH, pH of stability, iron (as Fe), manganese (as Mn), chlorides (as Cl), sulfate (as/SO4), fluorides (as F), nitrate nitrogen (as N), sodium (as Na), potassium (as K), and total solids. It was necessary to develop a system for comparing existing quality with some accepted standards or criteria. Comparisons permitted as indication of the number of supplies and the populations they served that met various selected concentrations. GRA

N77-30288*# National Aeronautics and Space Administration. Goddard Inst. for Space Studies, New York.
APPLICATIONS OF SPACE TECHNOLOGY TO WATER RESOURCES MANAGEMENT
V. V. Salomonson *In its* Proc. of the ASPE/MSFC Symp. on Eng. and Productivity Gains from Space Technol. May 1977 p 195-196 (For primary document see N77-30273 21-31)
Avail: NTIS HC A13/MF A01 CSCL 08H

N77-30289*# National Aeronautics and Space Administration. Goddard Inst. for Space Studies, New York.
SPACE TECHNOLOGY IN THE DISCOVERY AND DEVELOPMENT OF MINERAL AND ENERGY RESOURCES
Paul D. Lowman *In its* Proc. of the ASPE/MSFC Symp. on Eng. and Productivity Gains from Space Technol. May 1977 p 197-199 refs (For primary document see N77-30273 21-31)
Avail: NTIS HC A13/MF A01 CSCL 08G

N77-30290*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
DATA MANAGEMENT FOR EARTH OBSERVATIONS
George F. McDonough *In its* Proc. of the ASPE/MSFC Symp. on Eng. and Productivity Gains from Space Technol. May 1977 p 201-210 (For primary document see N77-30273 21-31)
Avail: NTIS HC A13/MF A01 CSCL 05B

44 ENERGY PRODUCTION AND CONVERSION

Includes specific energy conversion systems, e.g., fuel cells and batteries; global sources of energy; fossil fuels; geophysical conversion; hydroelectric power; and wind power.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *85 Urban Technology and Transportation.*

N77-30595 Stanford Univ., Calif.
PREPARATION AND PROPERTIES OF GROWN JUNCTION GaAs SOLAR CELLS Ph.D. Thesis
Lawrence Chin-Chiu Shen 1976 79 p
Avail: Univ. Microfilms Order No. 77-7166

GaAs solar cells with grown p-n junctions are fabricated and investigated. Minority carrier diffusion lengths in Ge doped liquid phase epitaxial GaAs layers are evaluated by using scanning electron microscope beam-induced current techniques. It is indicated that grown junction GaAs solar cells have several technical advantages and are practical to construct. Dissert. Abstr.

N77-30596 Tennessee Univ., Knoxville.
A DIGITAL SIMULATION FOR NUCLEAR ONCE-THROUGH STEAM GENERATORS Ph.D. Thesis
Alan Ten-lien Chen 1976 266 p
Avail: Univ. Microfilms Order No. 77-10757

Mathematical models for calculating the dynamic response of the Oconee type once through steam generator (OTSG) and the integral economizer once through steam generator (EOTSG) were developed. Linear and nonlinear models of both steam generator types were formulated using the state variable, lumped parameter approach. Transient and frequency responses of system parameters were calculated for various perturbations from both the primary coolant side and the secondary side. Transients of key parameters, including primary outlet temperature, superheated steam outlet temperature, boiling length/subcooled length and steam pressure, were generated, compared and discussed for both steam generator types. Frequency responses of the linear OTSG model were validated by using the dynamic testing results obtained at the Oconee I nuclear power station. Dissert. Abstr.

N77-30597 Southern Methodist Univ., Dallas, Tex.
POLYCRYSTALLINE SILICON SOLAR CELLS ON RECRYSTALLIZED METALLURGICAL SILICON Ph.D. Thesis
Hyouk Yoo, II 1976 114 p
Avail: Univ. Microfilms Order No. 77-9783

Polycrystalline silicon substrates were prepared by the unidirectional recrystallization of the purified metallurgical silicon in a graphite boat, and their structural and electrical properties are characterized. Solar cell structures were deposited on the recrystallized metallurgical silicon substrates by the hydrogen reduction of trichlorosilane containing appropriate dopants. Limited studies on the effects of thickness and dopant concentration in the epitaxial silicon layers were carried out. The dark current-voltage measurements of the solar cells indicated the recombination and shunt dominant characteristics in polycrystalline junctions at voltages below about 0.3 V. The current-voltage characteristics of epitaxial solar cells measured under illumination indicated that their AMO efficiencies were up to 5%. Solar cells were also fabricated from the recrystallized metallurgical silicon by the diffusion technique; however, their AMO efficiencies were only of the order of 1.5%. Dissert. Abstr.

N77-30598*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EVALUATION OF PHASE 2 CONCEPTUAL DESIGNS AND IMPLEMENTATION ASSESSMENT RESULTING FROM THE ENERGY CONVERSION ALTERNATIVES STUDY (ECAS)
Apr. 1977 605 p refs
(Contract E(49-18)-1751)
(NASA-TM-73515; E-8596) Avail: NTIS HC A99/MF A01 CSCL 10B

Advanced systems using coal and coal-derived fuels for base-load electric power generation were compared. The study was conducted in two phases. Phase 1 consisted of a parametric analysis. From these results, 11 concepts were selected for further study in Phase 2. For each of the Phase 2 systems and a common set of ground rules, the performance, cost, environmental intrusion, and natural resource requirements were estimated. In addition, the contractors defined the state of technology, identified advances required, and prepared preliminary research and development plans and an implementation assessment. The systems studied in Phase 2 include steam systems with atmospheric-and pressurized-fluidized-bed boilers combined gas turbine/steam systems with integrated gasifiers or fired by a

semiclean, coal-derived fuel; a potassium/steam system with a pressurized-fluidized-bed boiler; a closed-cycle gas turbine/organic system with a high-temperature, atmospheric-fluidized-bed furnace; a direct-coal-fired, open-cycle magnetohydrodynamic/steam system; and a moltencarbonate fuel cell/steam system with integrated gasifier. The Phase 2 results are summarized and compared and presented together with NASA analysis and evaluation. The common ground rules specified for the study are presented. The sensitivity of the results to changes in the ground rules and the impact of uncertainties in capital cost estimates are examined. Author

N77-30599*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
DYNAMIC BLADE LOADING IN THE ERDA/NASA 100 kW AND 200 kW WIND TURBINES
D. A. Spera, D. C. Janetzke, and T. R. Richards Aug. 1977 16 p refs Presented at the Natl. Conf. of the Am. Wind Energy Assoc., Boulder, Colo., 11-14 May 1977
(Contract E(49-26)-1004)
(NASA-TM-73711; ERDA/NASA-1004-77/2; E-9242) Avail: NTIS HC A02/MF A01 CSCL 10A

Dynamic blade loads, including aerodynamic, gravitational, and inertial effects, are presented for two large horizontal-axis wind turbines: the ERDA-NASA 100 kW Mod-0 and 200 kw Mod-0A wind power systems. Calculated and measured loads are compared for an experimental Mod-0 machine in operation. Predicted blade loads are also given for the higher power Mod-0A wind turbine now being assembled for operation as part of a municipal power plant. Two major structural modifications have been made to the Mod-0 wind turbine for the purpose of reducing blade loads. A stairway within the truss tower was removed to reduce the impulsive aerodynamic loading caused by the tower wake on the downwind rotor blades. Also, the torsional stiffness of the yaw drive mechananism connecting the turbine nacelle to the tower was doubled to reduce rotor-tower interaction loads. Measured reductions in load obtained by means of these two modifications equaled or exceeded predictions. Author

N77-30600*# Texas Instruments, Inc., Dallas.
AUTOMATED ARRAY ASSEMBLY TASK, PHASE 1 Quarterly Report
Bernard G. Carbajal Jul. 1977 37 p refs Sponsored in part by ERDA Prepared for JPL
(Contract NAS7-100; JPL-954405)
(NASA-CR-153874; ERDA/JPL-954405-77/6; TI-03-77-31) Avail: NTIS HC A03/MF A01 CSCL 10A

Various aspects of a sensitivity analysis, in particular, the impact of variations in metal sheet resistivity, metal line width, diffused layer sheet resistance, junction depth, base layer lifetime, optical coating thickness and optical coating refractive index and on process reproducibility for A's diffusion from a polymer dopant source and on module fabrication were studied. Model calculations show that acceptable process windows exist for each of these parameters. Author

N77-30601*# Motorola, Inc., Phoenix, Ariz.
SEMICONDUCTOR GRADE, SOLAR SILICON PURIFICATION PROJECT Technical Quarterly Report, 1 Apr. - 30 Jun. 1977
William M. Ingle, Robert Chaney, and Stephen Thompson 25 Jul. 1977 31 p refs Sponsored in part by ERDA Prepared for JPL
(Contracts NAS7-100; JPL-954442)
(NASA-CR-153406; ERDA/JPL-954442-77/3; Rept-2257/6; QTR-6) Avail: NTIS HC A03/MF A01 CSCL 10A

The potential for a three step SiF2 polymer transport purification process was examined. The process involves reacting low cost mg silicon with SiF4 to yield SiF2 gas which is condensed to form polymeric (SiF2)x. The polymer is then heated above 400 C to yield Si, SiF4 and higher Si sub n F sub 2n+2 homologues. This report presents and discusses continuing progress on (1) observations on (SiF2)x polymer formation and depolymerization on the small coil, (2) mass balance studies, (3) partial pressures of SiF2 and SiF4, (4) AlF3 mass spectral studies, and (5) material analysis studies. Author

N77-30602*# Mobil Tyco Solar Energy Corp., Waltham, Mass.
LARGE AREA SILICON SHEET BY EFG Quarterly Report, 1 Apr. - 30 Jun. 1977
15 Jun. 1977 108 p refs Sponsored in part by ERDA Prepared for JPL
(Contracts NAS7-100; JPL-954355)
(NASA-CR-153400; ERDA/JPL-954355-77/2) Avail: NTIS HC A06/MF A01 CSCL 10A

Some hypotheses to explain both of these features are advanced and the possible implications for solar cell performance are touched upon. The multiple ribbon growth system has shown a number of flaws with respect to the reliability of the basic furnace design. These definitely need to be rectified before any significant demonstration of multiple ribbon growth can proceed. The cartridges, however, have performed quite well. The work on 3' cartridge design and automatic controls has proceeded nearly on schedule and the report contains a detailed description of the approach and the equipment to be used for automatic control of ribbon growth. Author

N77-30603*# International Business Machines Corp., Hopewell Junction, N.Y. East Fishkill Labs.
SILICON RIBBON GROWTH BY A CAPILLARY ACTION SHAPING TECHNIQUE Quarterly Technical Progress Report
G. H. Schwuttke, T. F. Ciszek, A. Kran, and K. Yang 1 Jul. 1977 130 p refs Sponsored in part by ERDA Prepared for JPL
(Contracts NAS7-100; JPL-954144)
(NASA-CR-153408; ERDA/JPL-954144-77/2; QTPR-8) Avail: NTIS HC A07/MF A01 CSCL 10A

The crystal-growth method under investigation is a capillary action shaping technique. Meniscus shaping for the desired ribbon geometry occurs at the vertex of a wettable dye. As ribbon growth depletes the melt meniscus, capillary action supplies replacement material. The configuration of the technique used in our initial studies is shown. The crystal-growth method has been applied to silicon ribbons it was found that substantial improvements in ribbon surface quality could be achieved with a higher melt meniscus than that attainable with the EFG technique. Author

N77-30604*# Solarex Corp., Rockville, Md.
ENERGY REQUIREMENT FOR THE PRODUCTION OF SILICON SOLAR ARRAYS Quarterly Report, 21 Mar. - 20 Jun. 1977
Joseph Lindmayer, Manfred Wihl, Alan Scheinne, and Andrew Morrison Jul. 1977 61 p refs Sponsored in part by ERDA Prepared for JPL
(Contracts NAS7-100; JPL-954606)
(NASA-CR-153409; ERDA/JPL-954606-77/1; SX/111/2Q; QR-2) Avail: NTIS CSCL 10A

Photovoltaics is subject of an extensive technology assessment in terms of its net energy potential as an alternate energy source. Reduction of quartzite pebbles, refinement, crystal growth, cell processing and panel building are evaluated for energy expenditure compared to direct, indirect, and overhead energies. Author

N77-30605*# Sensor Technology, Inc., Chatsworth, Calif.
DEVELOPMENT OF LOW COST, HIGH ENERGY-PER-UNIT-AREA SOLAR CELL MODULES Quarterly Report, 1 Apr. - 30 Jun. 1977
Gregory T. Jones and Sanjeev Chitre Jun. 1977 59 p Sponsored in part by ERDA Prepared for JPL
(Contracts NAS7-100; JPL-954605)
(NASA-CR-153977; ERDA/JPL-954605-77/2; QR-2) Avail: NTIS HC A04/MF A01 CSCL 10A

Work on the development of low cost, high energy per unit area solar cell modules was conducted. Hexagonal solar cell and module efficiencies, module packing ratio, and solar cell design calculations were made. The cell grid structure and interconnection pattern was designed and the module substrates were fabricated for the three modules to be used. It was demonstrated that surface macrostructures significantly improve cell power output and photovoltaic energy conversion efficiency. Author

N77-30606*# Dow Corning Corp., Hemlock, Mich. Solid-State Research and Development Lab.
SOLAR SILICON VIA IMPROVED AND EXPANDED METALLURGICAL SILICON TECHNOLOGY Quarterly Report, Apr. - Jun. 1977
L. P. Hunt, V. D. Dosaj, and J. R. McCormick Jul. 1977 87 p refs Sponsored in part by ERDA Prepared for JPL
(Contracts NAS7-100; JPL-954559)
(NASA-CR-153415; ERDA/JPL-954559-77/2; QR-4) Avail: NTIS HC A05/MF A01 CSCL 10A

A completed preliminary survey of silica sources indicates that sufficient quantities of high-purity quartz are available in the U.S. and Canada to meet goals. Supply can easily meet demand for this little-sought commodity. Charcoal, as a reductant for silica, can be purified to a sufficient level by high-temperature fluorocarbon treatment and vacuum processing. High-temperature treatment causes partial graphitization which can lead to difficulty in smelting. Smelting of Arkansas quartz and purified charcoal produced kilogram quantities of silicon having impurity levels generally much lower than in MG-Si. Half of the goal was met of increasing the boron resistivity from 0.03 ohm-cm in metallurgical silicon to 0.3 ohm-cm in solar silicon. A cost analysis of the solidification process indicate $3.50-7.25/kg Si for the Czochralski-type process and $1.50-4.25/kg Si for the Bridgman-type technique. Author

N77-30607*# Stanford Univ., Calif.
NOVEL DUPLEX VAPOR-ELECTROCHEMICAL METHOD FOR SILICON SOLAR CELLS Quarterly Progress Report, 1 Feb. - 30 Apr. 1977
Vijay K. Kapur, Leonard Nanis, and Angel Sanjurjo Jul. 1977 36 p refs Sponsored in part by ERDA Prepared for JPL
(Contracts NAS7-100; JPL-955471; SRI Proj. PYU-4980)
(NASA-CR-153407; ERDA/JPL-954471-77/2; QPR-5) Avail: NTIS HC A03/MF A01 CSCL 10A

Silicon was produced by alternate pulse feeding of the reactants SiF4 gas and liquid sodium. The average temperature in the reactor could be controlled, by regulating the amount of reactant in each pulse. Silicon tetrafluoride gas was analyzed by mass spectrometry to determine the nature and amount of contained volatile impurities which included silicon oxyfluorides, sulfur oxyfluorides, and sulfur dioxide. Sodium metal was analyzed by emission spectrography, and it was found to contain only calcium and copper as impurities. Author

N77-30608*# Barry (Theodore) and Associates, Los Angeles, Calif.
A REVIEW OF THE SOLAR ARRAY MANUFACTURING INDUSTRY COSTING STANDARDS
Jul. 1977 134 p Sponsored in part by ERDA Prepared for JPL
(Contract NAS7-100; JPL-954800)
(NASA-CR-153401; ERDA/JPL-954800-77/1) Avail: NTIS HC A07/MF A01 CSCL 10A

The solar array manufacturing industry costing standards model is designed to compare the cost of producing solar arrays using alternative manufacturing processes. Constructive criticism of the methodology used is intended to enhance its implementation as a practical design tool. Three main elements of the procedure include workbook format and presentation, theoretical model validity and standard financial parameters. Author

N77-30609*# Bechtel Corp., San Francisco, Calif.
ENGINEERING STUDY OF THE MODULE/ARRAY INTERFACE FOR LARGE TERRESTRIAL PHOTOVOLTAIC ARRAYS Final Report
Jun. 1977 165 p refs Sponsored in part by ERDA Prepared for JPL
(Contracts NAS7-100; JPL-954698)
(ERDA/JPL-954698-77/1) Avail: NTIS HC A08/MF A01 CSCL 10A

Three major areas--structural, electrical, and maintenance--were evaluated. Efforts in the structural area included establishing acceptance criteria for materials and members, determining loading criteria, and analyzing glass modules in various framing system configurations. Array support structure design was addressed briefly. Electrical considerations included evaluation of module characteristics, intermodule connectors, array wiring, converters and lightning protection. Plant maintenance features such as array cleaning, failure detection, and module installation and replacement were addressed. Author

N77-30610*# Energy Research Corp., Danbury, Conn.
FABRICATION AND TESTING OF LARGE SIZE NICKEL-ZINC CELLS
Martin Klein Apr. 1977 62 p ref
(Contract NAS3-19415)
(NASA-CR-135200) Avail: NTIS HC A04/MF A01 CSCL 10C

The design and construction of nickel zinc cells, containing sintered nickel electrodes and asbestos coated inorginic separator materials, were outlined. Negative electrodes were prepared by a dry pressing process while various inter-separators were utilized on the positive electrodes, consisting of non-woven nylon, non-woven polypropylene, and asbestos. Author

N77-30611*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
DRIVE TRAIN NORMAL MODES ANALYSIS FOR THE ERDA/NASA 100-KILOWATT WIND TURBINE GENERATOR
T. L. Sullivan, D. R. Miller, and D. A. Spera Jul. 1977 34 p refs
(Contract E(49-26)-1028)
(NASA-TM-73718; E-9266; ERDA/NASA-1028-77/1) Avail: NTIS HC A03/MF A01 CSCL 10B

Natural frequencies, as a function of power were determined using a finite element model. Operating conditions investigated were operation with a resistive electrical load and operation synchronized to an electrical utility grid. The influence of certain drive train components on frequencies and mode shapes is shown. An approximate method for obtaining drive train natural frequencies is presented. Author

N77-30612*# Little (Arthur D.), Inc., Cambridge, Mass.
EVALUATION OF SOLAR CELLS FOR POTENTIAL SPACE SATELLITE POWER APPLICATIONS Final Report
1 Jun. 1977 56 p refs
(Contract NAS9-15294)
(NASA-CR-151498) Avail: NTIS HC A04/MF A01 CSCL 10A

The evaluation focused on the following subjects: (1) the relative merits of alternative solar cell materials, based on performance and availability, (2) the best manufacturing methods for various solar cell options and the effects of extremely large production volumes on their ultimate costs and operational characteristics, (3) the areas of uncertainty in achieving large solar cell production volumes, (4) the effects of concentration ratios on solar array mass and system performance, (5) the factors influencing solar cell life in the radiation environment during transport to and in geosynchronous orbit, and (6) the merits of conducting solar cell manufacturing operations in space. Author

N77-30613*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
HORIZONTALLY MOUNTED SOLAR COLLECTOR Patent Application
Dolphus H. Black, inventor (to NASA) Filed 9 Aug. 1977 18 p
(NASA-Case-MFS-23349-1; US-Patent-Appl-SN-823061) Avail: NTIS HC A02/MF A01 CSCL 10A

A horizontally mounted solar collector for collecting solar energy utilizing a vertical deflector assembly, a stationary reflector and a collector is described. The deflector assembly contains a plurality of vanes which change the direction of the solar energy to the vertical while constantly keeping the same side of the deflector facing the sun. The vertical rays are then reflected off the stationary reflector and are then absorbed by the collector. NASA

N77-30614# Delaware Univ., Newark. Inst. of Energy Conversion.
RESEARCH DIRECTED TO STABLE HIGH EFFICIENCY CdS SOLAR CELLS Final Report, 1 Jan. - 30 Jun. 1976
Mar. 1977 81 p refs
(Grant NSF AER-72-03478)

(NSF/RANN/AER72-03478-A04/FR-76) Avail: NTIS HC A05/MF A01

Replacing the cadmium sulfide layer with a mixed zinc cadmium sulfide has been shown to produce enhanced open circuit voltages up to 0.7 V. Initial cells showed relatively poor efficiencies due to low short circuit currents. This has been shown to be mainly due to the poor quality of the Cu2S produced on the mixed sulfide substrate. It is anticipated that further work will result in raising short circuit currents to the levels achievable with the CdS/Cu2S cell. Analysis shows that the ultimate efficiency of this cell should be about 15%. Author

N77-30615*# Mitre Corp., Bedford, Mass.
IN SITU PERFORMANCE MEASUREMENTS OF THE MITRE PHOTOVOLTAIC ARRAY
A. S. Cherdak and G. M. Haas Aug. 1977 108 p ref Sponsored in part by ERDA Prepared for JPL
(Contracts NAS7-100; JPL-954342)
(NASA-CR-153888; MTR-7255) Avail: NTIS HC A06/MF A01 CSCL 10A

A data acquisition system was developed to provide more accurate and consistent measurement of the degradation of solar arrays. A technique was developed for in-situ measurement of photovoltaic panels of sufficient quality to permit evaluation of electrical performance over extended periods of several years. I.M.

N77-30616*# National Aeronautics and Space Administration. Pasadena Office, Calif.
A THERMAL ENERGY TRANSFORMER Patent Application
C. Martin Berdahl (JPL) and Carl L. Thiele, inventors (to NASA) (JPL) Filed 12 Aug. 1977 13 p
(Contract NAS7-100)
(NASA-Case-NPO-14058-1; US-Patent-Appl-SN-824024) Avail: NTIS HC A02/MF A01 CSCL 10B

For use in combination with a heat engine, a thermal energy transformer is described. It comprises a flux receiver, having a first wall defining therein a radiation absorption cavity for converting solar flux to thermal energy characterized by a first wall defining a radiation absorption cavity having a solar flux energy aperture, and a second wall defining an energy transfer wall for the heat engine, and a heat pipe chamber interposed between the first and second walls having a working fluid disposed within the chamber and a wick lining the chamber for conducting the working fluid from the second wall to the first wall, whereby thermal energy is transferred from the radiation absorption cavity to the heat engine. NASA

N77-30617*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
AN ANALYTICAL AND EXPERIMENTAL INVESTIGATION OF A 1.8 BY 3.7 METER FRESNEL LENS SOLAR CONCENTRATOR
Leon J. Hastings, Steve L. Allums, and Warren S. Jensen Aug. 1977 77 p refs
(NASA-TP-1005; M-224) Avail: NTIS HC A05/MF A01 CSCL 10A

Line-focusing acrylic Fresnel lenses with application potential in the 200 to 370 C range are being analytically and experimentally evaluated. Investigations previously conducted with a 56 cm wide lens have been extended by the present study to experimentation/analyses with a 1.8 by 3.7 m lens. A measured peak concentration ratio of 64 with 90 percent of the transmitted energy focused into a 5.0 cm width was achieved. A peak concentration of 61 and a 90 percent target width of 4.5 cm were analytically computed. The experimental and analytical lens transmittance was 81 percent and 86 percent, respectively. The lens also was interfaced with a receiver assembly and operated in the collection mode. The collection efficiency ranged from 42 percent at 100 C to 26 percent at 300 C. Author

N77-30618*# North Carolina State Univ., Raleigh. Dept. of Electrical Engineering.
A THEORETICAL STUDY OF HETEROJUNCTION AND GRADED BAND GAP TYPE SOLAR CELLS Annual Report
J. E. Sutherland and J. R. Hauser Apr. 1977 150 p refs
(Grant NsG-1116)
(NASA-CR-154783) Avail: NTIS HC A07/MF A01 CSCL 10A

A computer program was designed for the analysis of variable composition solar cells and applied to several proposed solar cell structures using appropriate semiconductor materials. The program simulates solar cells made of a ternary alloy of two binary semiconductors with an arbitrary composition profile, and an abrupt or Gaussian doping profile of polarity n-on-p or p-on-n with arbitrary doping levels. Once the device structure is specified, the program numerically solves a complete set of differential equations and calculates electrostatic potential, quasi-Fermi levels, carrier concentrations and current densities, total current density and efficiency as functions of terminal voltage and position within the cell. These results are then recorded by computer in tabulated or plotted form for interpretation by the user. Author

N77-30619# General Atomic Co., San Diego, Calif.
DEVELOPMENT OF THERMOCHEMICAL WATER SPLITTING FOR HYDROGEN PRODUCTION AT GENERAL ATOMIC COMPANY
J. L. Russell, Jr., K. H. McCorkle, J. H. Norman, J. R. Schuster, and P. W. Trester 30 Sep. 1976 131 p refs
(GA-A-14050) Avail: NTIS HC A07/MF A01

Prospects for future hydrogen consumption and the theoretical bases for water splitting are discussed. Other topics include chemical cycle development, process engineering, and materials investigations. Possible heat sources considered are gas-cooled and fusion reactors and solar energy concentrating systems. Author

N77-30620# Mitre Corp., Bedford, Mass.
WIND MACHINES
Frank R. Eldridge Oct. 1975 81 p refs
(Grant NSF AER-75-12937)
(NSF/RA/N-75-051) Avail: NTIS MF A02; SOD HC $2.25

Present status of the viability, history, taxonomy, and future potential of various types and sizes of wind machines that might be used to help meet future U.S. energy demands was outlined. Various possible applications of wind machines, as well as siting problems, also performance characteristics, and system designs for such machines were also discussed. Author

N77-30621# Defense Documentation Center, Alexandria, Va.
SOLAR CELLS AND SOLAR PANELS Report Bibliography, Oct. 1958 - Sep. 1976
Apr. 1977 268 p refs Supersedes DDC-TAS-73-51
(AD-A039100; DDC/BIB-76/04; DDC-TAS-73-51) Avail: NTIS HC A12/MF A01 CSCL 10/2

This bibliography is a selection of unclassified and unlimited distribution references on Solar Cells and Solar Panels. These citations of reports present information on performance characteristics, fabrication, development of power levels, degradation studies of solar cells, and systems for orienting solar panels continuously toward the sun. Corporate Author-Monitoring Agency, Subject, Title and Personal Author are provided. Author (GRA)

N77-30622# Hittman Associates, Inc., Columbia, Md.
ENERGY UTILIZATION INDEX METHOD FOR PREDICTING BUILDING ENERGY USE. VOLUME 1: METHOD DEVELOPMENT Interim Report
L. M. Windingland and D. C. Hittle Champaign, Ill. Army Construct. Eng. Res. Lab. May 1977 173 p refs
(Contract DACA23-76-C-0001; DA Proj. 4A7-62719-AT-41)
(AD-A039913; CERL-IR-E-105-Vol-1) Avail: NTIS HC A08/MF A01 CSCL 13/13

This report describes development of the Energy Utilization Index (EUI) method for manually calculating monthly and annual energy consumption for buildings on military installations. The method uses basic building parameters such as U-factors, dimensions, occupancy, type of HVAC equipment, and average monthly weather conditions to arrive at a prediction for a building's monthly and annual energy use. Procedures for aggregating individual building consumption data into facility and installation consumption predictions are provided. The method for correcting the predictions to account for actual weather conditions is also described. Volume I describes the development of the EUI method, tells how the method is used, and com-

pares predictions generated by the method with actual consumption data. A comparison of + or - 4 percent was shown for one building type. GRA

N77-30623# Tetra Tech, Inc., Arlington, Va.
US NAVY ENERGY R AND D Progress Report, Oct. 1976 - Mar. 1977
Apr. 1977 141 p refs
(Contract N00014-76-C-0239)
(AD-A039546; TT-A-872-77-316) Avail: NTIS HC A07/MF A01 CSCL 10/1

This U.S. Navy Energy R and D Progress report summarizes the progress and accomplishments of the Navy Energy R and D Program for the period from October 1976 through March 1977. This report complements the U.S. Navy Energy R and D Program Plan, FY 1977-FY 1982, published in October 1976. Author (GRA)

N77-30624# EIC, Inc., Newton, Mass.
LITHIUM-INORGANIC ELECTROLYTE BATTERIES Progress Report, 16 Jun. - 31 Dec. 1976
Joseph R. Driscoll, Gerhard L. Holleck, David E. Toland, and S. Barry Brummer Apr. 1977 44 p refs
(Contract DAAB07-74-C-0030; DA Proj. 1T1-61102-A-34A)
(AD-A039361; C-401-12; ECOM-74-0030-12; PR-12) Avail: NTIS HC A03/MF A01 CSCL 10/3

This report is an annual summary which includes the past quarter's data. The major area of investigation during this time has been into the voltage delays and depression observed after storage at 71 C (160 F). The voltage delay and depression are due to films which form on the Li surface. Emission spectrographic analysis has shown Cu and Fe are particulary enriched in this film. GRA

N77-30625# GTE Labs., Inc., Waltham, Mass.
SEALED LITHIUM INORGANIC ELECTROLYTE CELL Final Report, Mar. 1974 - Oct. 1976
N. Marincic and A. Lombardi Apr. 1977 221 p refs
(Contract DAAB07-74-C-0108)
(AD-A039336; ECOM-74-0108-F) Avail: NTIS HC A10/MF A01 CSCL 10/3

Most of the work was done with the components or subassemblies intended for use in wound electrode structures, i.e. the cells designed for a high rate of discharge, although the laboratories: models and the low rate cells were used on occasions as the test vehicles in the evaluation of performance parameters of this electrochemical system. The report is arranged chronologically, presenting the characteristics of the system, followed by the design, testing and evaluation of finished, sealed D size cells. The rate capability of the cell was established, along with the side effects of discharge at extreme rates such as the thermal runaway, gassing at the end of discharge, etc. Protective devices were developed and tested, preventing the discharge at excessive rates (fuses) or opening the cell to the atmosphere (venting) before it reaches critical pressure and temperature that leads to explosion. The procedures were developed for a computer aided design and optimization of electrode structures, enabling the construction of D cell exceeding the energy density of 500 Wh/kg and 17 Wh/cu in. GRA

N77-30626# UOP, Inc., Des Plaines, Ill.
OPTIMIZATION OF PLATIUM-DOPED KOCITE ELECTRODES IN H3PO4 FUEL CELLS Interim Progress Report, Sep. - Dec. 1976
L. B. Welsh and R. W. Leyerle Mar. 1977 88 p refs
(Contract DAAG53-76-C-0014; DA Proj. 1G7-62708-AH-78)
(AD-A039242; IPR-3) Avail: NTIS HC A05/MF A01 CSCL 09/1

The use of UOP platinum impregnated Kocite materials as low-cost air and/or fuel electrocatalysts in phosphoric acid electrolyte fuel cells has been optimized with respect to some of the electrocatalyst and electrode structure parameters. Kocite materials are composite structures consisting of pyropolymers chemically bonded to refractory substrates. Fuel cell electrodes were fabricated from these materials and tested as anodes or cathodes in model fuel cells with Teflon-bonded platinum-black counter electrodes. GRA

N77-30627# Naval Air Engineering Center, Lakehurst, N.J. Dept. of Ground Support Equipment
MOBILE ELECTRIC POWER PLANT (MEPP) TEST SET DEVELOPMENT Interim Report, Jul. 1975 - Jun. 1976
J. A. Kershaw, Jr. 19 May 1977 22 p
(AD-A040259; NAEC-GSED-103) Avail: NTIS HC A02/MF A01 CSCL 14/2

Military Standard 704B tightens the parametric tolerances governing the quality of power being generated for the various types of aircraft equipment either in use or currently undergoing development. The objective of the work being performed herein is to determine the configuration and cost of a test set that would be used to ensure the power supplied by Mobile Electric Power Plants (MEPP's) is within the tolerances defined in the specification. Surveys of the test equipment field were made, vendors were contacted and demonstrations for equipment evaluations were conducted, and in use assets were considered for MEPP evaluation after consultation with Navy field personnel. Subsequently, a breadboard model of the test set will be constructed and the basic design configuration will be established. Since the equipment necessary to test MEPP's and aircraft generators for compliance with MIL-STD-STD-704B is not available either in a configuration or in quantities that permit its utilization by organizational and intermediate maintenance personnel, it is recommended that a test set be developed that can be used by other than depot level maintenance personnel to ensure that future operational field equipment can be checked for compliance with the new specification. Author (GRA)

N77-30628# Oak Ridge National Lab., Tenn.
SAVINGS IN ENERGY CONSUMPTION BY RESIDENTIAL HEAT PUMPS: THE EFFECTS OF LOWER INDOOR TEMPERATURES AND OF NIGHT SETBACK
R. D. Ellison Jan. 1977 32 p refs
(Contracts W-7405-eng-26; FEA-CG-04-75-012-0)
(ORNL/CON-4) Avail: NTIS HC A03/MF A01

The energy saving potential of reduced indoor temperatures and of night setback is examined for residential heat pumps. A computer program was used to calculate heating loads, to modify and to evaluate the heating capacity, energy consumption, and running time of heat pumps on an hourly basis as a function of outdoor dry bulb temperature, and to simulate the use and energy consumption of auxiliary resistance heaters. Annual heating loads, energy consumption, percentage savings, and seasonal COP's, Coefficients of performance, are presented for several indoor temperature regimes and a variety of climatic conditions. Hourly profiles of these quanities give some insight into the energy savings found. ERA

N77-30629# Data Resources, Inc., Lexington, Mass.
RESIDENTIAL DEMAND FOR ENERGY, VOLUME 1 Final Report
Lester D. Taylor (Arizona Univ., Tempe), Gail R. Blattenberger, and Philip K. Verleger, Jr. Jan. 1977 148 p refs
(EPRI Proj. 431-1)
(EPRI-EA-235-Vol-1) Avail: NTIS HC A07/MF A01

Residential demand for energy over the period 1956 to 1972, with principal emphasis on the residential demand for electricity is examined. Decreasing block pricing in the sale of electricity, in a manner that is appropriate theoretically and sound econometrically was studied. A price data set was constructed derived from actual residential rate schedules. ERA

N77-30630# Texas Technological Univ., Lubbock. Dept. of Electrical Engineering.
PULSE POWER SYSTEMS EMPLOYING MAGNETIC ENERGY STORAGE Final Report, 22 Dec. 1975 - 21 Apr. 1977
Thomas F. Trost May 1977 69 p refs
(Contract N60921-76-C-0092)
(AD-A039897) Avail: NTIS HC A04/MF A01 CSCL 09/5

Several basic aspects of pulsed power systems supplying repetitive pulses and using inductive energy storage are investigated. These include the method of inductor charging, the efficiency of discharging with a resistive opening switch, the limitations of thermally driven resistors as opening switches, the design of pulse forming networks for time-varying resistive

loads and the relative merits of voltage-fed versus current-fed networks, and some limitations on inductors. Author (GRA)

N77-30631# Army Cold Regions Research and Engineering Lab., Hanover, N. H.
DEMONSTRATION OF BUILDING HEATING WITH A HEAT PUMP USING THERMAL EFFLUENT Special Report
Peter W. Sector May 1977 30 p refs
(AD-A041024; CRREL-SR-77-11) Avail: NTIS HC A03/MF A01 CSCL 13/1

This report describes efforts made to recover waste heat and to reuse it to heat a building. A heat pump, which is a refrigeration device, was operated to provide building heat and to demonstrate both economic benefits and energy savings possible with this type of heating system. Heat pump fundamentals and system design considerations supplement the report of this demonstration project. Operational characteristics were monitored and are reported. A 25% reduction in heating costs was observed compared with an oil-fired system. The author recommends that the minimum coefficient of performance should be 3.4 for a cost effective, energy-conservative heat pump heating system. Author (GRA)

N77-30632# Colorado Springs Dept. of Public Utilities, Colo.
ASSESSMENT OF A SINGLE-FAMILY RESIDENCE SOLAR HEATING SYSTEM IN A SUBURBAN DEVELOPMENT SETTING. PROJECT PHOENIX Final Report, 1 Jul. 1974 - 1 Jul. 1976
J. D. Phillips Jul. 1976 180 p refs
(Grant NSF GI-44210)
(PB-263192/7; NSF/RA-760192) Avail: NTIS HC A09/MF A01 CSCL 13A

The Phoenix Project is an indepth investigation into a fluid-to-air solar optimized heat pump. The approach used was to construct a house heated by a solar optimized heat pump. The house and heating system were tested under actual operating conditions for a period of two years. The major conclusion is that a solar optimized heat pump system for residential application is now a viable alternative to conventional fuel sources. GRA

N77-30633# Federal Energy Administration, Washington, D. C. Office of the Administrator.
ENERGY SITUATION
Jul. 1976 23 p
(PB-266836/6; FEA/T-77/177) Avail: NTIS HC A02/MF A01 CSCL 21D

Energy consumption rate in the United States is evaluated. Even with sharp increases in energy prices following the Arab embargo, the use of energy per dollar GNP has remained relatively stable. Domestic oil production, which has been declining since 1970, will continue to do so, but at a rate less than that experienced prior to the 1973-1974 embargo. Production will stabilize and then increase in the next few years as approximately 1.6 million barrels per day of Alaskan oil is transported to the lower 48 states. GRA

N77-30634# Iroquois Research Inst., Fairfax, Va.
ARCHAEOLOGICAL AND HISTORICAL INVESTIGATIONS FOR ENERGY FACILITIES: A STATE OF THE ART REPORT
Feb. 1977 292 p refs
(Contract FR-1807)
(PB-266772/3; LC-77-70222) Avail: NTIS HC A13/MF A01 CSCL 05K

Federal regulations and methods used for conducting surveys in protecting the cultural resources are examined, and cultural resource investigations are conducted, including their costs and their relationship to the design and construction of energy facilities. GRA

N77-30635# California Polytechnic State Univ., San Luis Obispo.
RESEARCH ON THE APPLICATION OF SOLAR ENERGY TO THE FOOD DRYING INDUSTRY Final Report
Thomas Lukes 31 Dec. 1975 118 p refs
(Grant NSF ERT-74-19063)
(PB-267210/3; NSF/RANN/SE/ERT-74-19063/FR-75; NSF/RA/N-75-294) Avail: NTIS HC A06/MF A01 CSCL 10A

Several solar collector configurations were investigated as to their suitability for drying food crops. Various fruits and vegetables were dried using a mixture of solar energy and steam heat or solar energy alone. Cost estimates (based on initial construction material costs only) indicate that when the price of oil delivered to this country reaches $17 per barrel, then solar energy becomes competitive. GRA

N77-30636# Federal Energy Administration, Washington, D. C. Office of Regulatory Programs.
CONTINUATION OF THE ADJUSTMENT AS A PRODUCTION INCENTIVE TO THE MAXIMUM WEIGHTED AVERAGE FIRST SALE PRICE FOR DOMESTIC CRUDE OIL (ENERGY ACTION NO. 11)
15 Mar. 1977 150 p refs
(PB-266841/6; FEA/H-77/176) Avail: NTIS HC A07/MF A01 CSCL 21D

Energy consideration measures dealing with amendment to the regulations; historical summary of the implementation of section 8 of the Emergency Petroleum Allocation Act of 1973 and projects prices for domestic crude oil with and without the adjustment as a production incentive are presented. GRA

N77-30637# California Univ., Davis. Inst. of Ecology.
LAND USE, ENERGY FLOW AND POLICY MAKING IN SOCIETY. SIMPAC HANDBOOK. A GUIDE TO THE MODELING OF SOCIO-ECONOMIC PHENOMENA
Peter J. Hunter, Nancy J. Mosman, and John L. Mitchiner 1975 291 p
(Grant NSF GI-27)
(PB-267134/5; NSF/RA/E-75-057) Avail: NTIS HC A12/MF A01 CSCL 10A

This handbook can be applied to a variety of socio-economic models. It provides a documented package of computer programs that are used to implement the methodology, and describes in detail the mechanics of transforming a conceptual model like SPECULATER in computer code. GRA

N77-30274*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
ERDA/NASA-MSFC SOLAR HEATING AND COOLING DEVELOPMENT AND DEMONSTRATION PROGRAM
John M. Price *In its* Proc. of the ASPE/MSFC Symp. on Eng. and Productivity Gains from Space Technol. May 1977 p 9-17 (For primary document see N77-30273 21-31)
Avail: NTIS HC A13/MF A01 CSCL 10A

N77-30275*# Alabama Power Co., Birmingham.
IMPACT OF ALTERNATIVE ENERGY FORMS ON PUBLIC UTILITIES
F. W. Keith, Jr. *In* NASA. Marshall Space Flight Center Proc. of the ASPE/MSFC Symp. on Eng. and Productivity Gains from Space Technol. May 1977 p 19-31 (For primary document see N77-30273 21-31)
Avail: NTIS HC A13/MF A01 CSCL 10A

N77-30276*# General Electric Co., Philadelphia, Pa. Space Div.
WIND ENERGY: A RENEWABLE ENERGY OPTION
James S. Zimmerman *In* NASA. Marshall Space Flight Center Proc. of the ASPE/MSFC Symp. on Eng. and Productivity Gains from Space Technol. May 1977 p 33-68 (For primary document see N77-30273 21-31)
Avail: NTIS HC A13/MF A01 CSCL 10A

N77-30277*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
RECENT DEVELOPMENTS IN PHOTOVOLTAIC ENERGY BY ERDA/NASA-LERC
James N. Deyo *In its* Proc. of the ASPE/MSFC Symp. on Eng. and Productivity Gains from Space Technol. May 1977 p 69-85 (For primary document see N77-30273 21-31)
Avail: NTIS HC A13/MF A01 CSCL 10A

N77-30278*# Energy Research and Development Administration, Washington, D.C. Ocean Systems Branch.
OCEAN THERMAL ENERGY CONVERSION (OTEC)
Abrahim Lavi *In* NASA. Marshall Space Flight Center Proc. of the ASPE/MSFC Symp. on Eng. and Productivity Gains from

Space Technol. May 1977 p 87-94 (For primary document see N77-30273 21-31)
Avail: NTIS HC A13/MF A01 CSCL 10A

N77-30279*# Martin Marietta Corp., Denver, Colo.
ERDA'S CENTRAL RECEIVER SOLAR THERMAL POWER SYSTEM STUDIES
Lester J. Lippy and Thomas R. Heaton *In* NASA. Marshall Space Flight Center Proc. of the ASPE/MSFC Symp. on Eng. and Productivity Gains from Space Technol. May 1977 p 95-123

N77-30525*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
TEST FACILITY FOR SOLAR-CELL REFERENCE CONDITIONS
Thomas M. Klucher *In its* Terrest. Photovoltaic Meas., 2 1976 p 67-78 refs Previously announced as N77-26618 (For primary document see N77-30521 21-42)
Avail: NTIS HC A17/MF A01 CSCL 10A

N77-30526*# Sandia Labs., Albuquerque, N. Mex.
THE EFFECTS OF SPECTRAL VARIATIONS ON SILICON CELL OUTPUT
E. C. Boes and I. J. Hall *In* NASA. Lewis Res. Center Terrest. Photovoltaic Meas., 2 1976 p 79-92 Sponsored by ERDA (For primary document see N77-30521 21-42)
Avail: NTIS HC A17/MF A01 CSCL 10A

N77-30527*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
THE EFFECT OF ATMOSPHERIC PARAMETERS ON SILICON CELL PERFORMANCE
Henry B. Curtis *In its* Terrest. Photovoltaic Meas., 2 1976 p 93-108 refs Previously announced as N77-26619 (For primary document see N77-30521 21-42)
Avail: NTIS HC A17/MF A01 CSCL 10A

N77-30528*# Delaware Univ., Newark.
SOLAR EXCITATION OF CdS/Cu2S PHOTOVOLTAIC CELLS CELLS
K. W. Boer *In* NASA. Lewis Res. Center Terrest. Photovoltaic Meas., 2 1976 p 109-150 refs (For primary document see N77-30521 21-42)
Avail: NTIS HC A17/MF A01 CSCL 10A

N77-30531*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
CONSIDERATION OF DESIGN AND CALIBRATION OF TERRESTRIAL REFERENCE SOLAR CELLS
V. G. Weizer *In its* Terrest. Photovoltaic Meas., 2 1976 p 203-222 refs Previously announced as N77-26621 (For primary document see N77-30521 21-42)
Avail: NTIS HC A17/MF A01 CSCL 10A

N77-30534*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
SENSITIVITY OF SOLAR CELL PERFORMANCE TO ATMOSPHERIC VARIABLES. 1: SINGLE CELL
Thomas M. Klucher *In its* Terrest. Photovoltaic Meas., 2 1976 p 247-258 refs Previously announced as N77-26623 (For primary document see N77-30521 21-42)
Avail: NTIS HC A17/MF A01 CSCL 10A

N77-30535*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
SENSITIVITY OF SOLAR-CELL PERFORMANCE TO ATMOSPHERIC VARIABLES. 2: DISSIMILAR CELLS AT SEVERAL LOCATIONS
Thomas M. Klucher and Russell E. Hart *In its* Terrest. Photovoltaic Meas., 2 1976 p 259-270 refs Previously announced as N77-26624 (For primary document see N77-30521 21-42)
Avail: NTIS HC A17/MF A01 CSCL 10A

N77-30536*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
INTRODUCTION TO BASIC SOLAR CELL MEASUREMENTS
Henry W. Brandhorst, Jr. *In its* Terrest. Photovoltaic Meas., 2 1976 p 275-300 refs Previously announced as N77-26625 (For primary document see N77-30521 21-42)
Avail: NTIS HC A17/MF A01 CSCL 10A

N77-30537*# Laboratoires d'Electronique et de Physique Appliquee, Paris Limeil-Brevannes (France).
CELL AND MODULE TEST PROCEDURES SEEN FROM THE MANUFACTURER AND THE USER POINT OF VIEW
Henry Durand *In* NASA. Lewis Res. Center Terrest. Photovoltaic Meas., 2 1976 p 301-308 (For primary document see N77-30521 21-42)
Avail: NTIS HC A17/MF A01 CSCL 10A

N77-30538*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
INDOOR AND OUTDOOR MEASUREMENTS OF PERFORMANCE OF PHOTOVOLTAIC ARRAYS
Henry B. Curtis *In its* Terrest. Photovoltaic Meas., 2 1976 p 309-322 refs Previously announced as N77-26626 (For primary document see N77-30521 21-42)
Avail: NTIS HC A17/MF A01 CSCL 10A

N77-30539*# Royal Aircraft Establishment, Farnborough (England).
RECOMMENDATIONS FOR THE PERFORMANCE RATING OF FLAT PLATE TERRESTRIAL PHOTOVOLTAIC SOLAR PANELS
F. C. Treble *In* NASA. Lewis Res. Center Terrest. Photovoltaic Meas., 2 1976 p 323-336 refs (For primary document see N77-30521 21-42)
Avail: NTIS HC A17/MF A01 CSCL 10A

N77-30540*# Sandia Labs., Albuquerque, N. Mex.
SILICON SOLAR CELL TESTING IN CONCENTRATED SUNLIGHT AND SIMULATED SUNLIGHT
E. L. Burgess and K. W. Mitchell *In* NASA. Lewis Res. Center Terrest. Photovoltaic Meas., 2 1976 p 337-354 refs Sponsored by ERDA (For primary document see N77-30521 21-42)
Avail: NTIS HC A17/MF A01 CSCL 10A

N77-30541*# Syracuse Univ., N. Y. Physical Electronics Lab.
ON THE DETERMINATION OF SERIES RESISTANCE AND DIODE QUALITY FACTOR OF SOLAR CELLS
R. L. Anderson *In* NASA. Lewis Res. Center Terrest. Photovoltaic Meas., 2 1976 p 347-354 refs (For primary document see N77-30521 21-42)
Avail: NTIS HC A17/MF A01 CSCL 10A

N77-30542*# Hitachi, Ltd., Tokyo (Japan). Central Research Lab.
PROBLEMS IN PHOTORESPONSE DISTRIBUTION MEASUREMENT
Shigekazzu Minagawa and Terunori Warabisako *In* NASA. Lewis Res. Center Terrest. Photovoltaic Meas., 2 1976 p 355-362 refs (For primary document see N77-30521 21-42)
Avail: NTIS HC A17/MF A01 CSCL 10A

N77-30543*# Joint Center for Graduate Study, Richland, Wash.
COLLECTION EFFICIENCY MEASUREMENTS FOR SOLAR CELL RESEARCH
Harry L. Hampton and Larry C. Olsen *In* NASA. Lewis Res. Center Terrest. Photovoltaic Meas., 2 1976 p 363-384 refs (For primary document see N77-30521 21-42)
(Grant NSF AER-75-20501)
Avail: NTIS HC A17/MF A01 CSCL 10A

N77-30544*# Delaware Univ., Newark. Inst. of Energy Conversion.
SPECTRAL RESPONSE MEAASUREMENTS WITH WHITE LIGHT BIAS
W. Devaney, S. Lorenz, and J. D. Meakin *In* NASA. Lewis Res. Ceneter Terrest. Photovoltaic Meas., 2 1976 p 385-398 refs (For primary document see N77-30521 21-42)
(Contract E(49-18)-2538; Grant NSF AER-72-03478)
Avail: NTIS HC A17/MF A01 CSCL 10A

refs (For primary document see N77-30273 21-31)
Avail: NTIS HC A13/MF A01 CSCL 10A

45 ENVIRONMENT POLLUTION

Includes air, noise, thermal and water pollution; environment monitoring; and contamination control.

N77-30638 Florida Univ., Gainesville.
MATHEMATICAL MODELS FOR PREDICTING THE DISPERSION OF ATMOSPHERIC POLLUTANTS Ph.D. Thesis
Kenneth Richard Szoc 1976 293 p
Avail: Univ. Microfilms Order No. 77-8226

A stochastic model and a deterministic model are presented for predicting atmospheric dispersion of pollutants. Monte Carlo simulation was extended to the non-neutral atmosphere. In the deterministic model an orthogonal collocation technique was used to solve the equation of conservation of mass. Dissert. Abstr.

N77-30639 Maryland Univ., College Park.
THE STUDY OF THE ELEMENTAL COMPOSITION OF PARTICULATE EMISSIONS FROM AN OIL-FIRED POWER PLANT Ph.D. Thesis
Eugene John Mroz 1976 281 p
Avail: Univ. Microfilms Order No. 77-10408

Samples of suspended particulate material collected from the stack and the plume of an oil fired plant were analyzed by instrumental neutron activation analysis for about 30 elements. Scanning electron microscopy coupled with electron beam induced x-ray fluorescence allowed the examination of individual particles. The purpose of this project was to determine the extent to which oil fired power plants contribute to the trace element concentration patterns observed on suspended particles in the atmospheres of urban areas. These studies also provided information about particle formation processes during the combusiton of fuel oil. Dissert. Abstr.

N77-30640 Marquette Univ., Milwaukee, Wis.
SOURCES AND SINKS OF CARBON MONOXIDE AND OZONE IN THE INDOOR ATMOSPHERE Ph.D. Thesis
William Clarence Koepsel 1976 69 p
Avail: Univ. Microfilms Order No. 77-6173

Carbon monoxide was chosen for investigation because of its relatively non-reactive nature, while ozone was studied because of its extreme reactivity. The two pollutants were monitored simultaneously and continually in both the indoor and the outdoor air. Sixteen residences, representing a sampling of virtually all geographic areas of metropolitan Milwaukee, were monitored. The average sampling duration was eight days. In three of the sampled homes, the sampling periods were three months; and the monitors were placed in various locations in these homes to determine differences within the same residence. Measurements of traffic flow outside the home were also made. A form was developed to indicate the resident's activities during the period sampled. Cooking of meats was the major source of carbon monoxide inside the home. Indoor ozone levels were due almost exclusively to outdoor ozone penetrating into the structure.
Dissert. Abstr.

N77-30641 Louisiana State Univ. and A&M Coll., Baton Rouge.
LIGANDS FOR THE DISSOLUTION OF AIRBORNE METAL PARTICULATES Ph.D. Thesis
Henri Frances Walker Merrick 1976 195 p
Avail: Univ. Microfilms Order No. 77-10385

Various techniques of sampling, dissolving, storing, and analyzing airborne metal particulates were investigated. An approach for determining the fraction of airborne metals that may pose health hazards was introduced. Several ligands were studied to determine their ability to solubilize metal oxides. An oxide generator was utilized to provide standard metal oxides. These standard oxides were used throughout the method development. A filter medium was used to collect both the generated samples and the field study samples. All samples were analyzed by either flame or flameless atomic absorption.
Dissert. Abstr.

N77-30642*# Harvard Univ., Cambridge, Mass. Center for Earth and Planetary Physics.
NITROUS OXIDE IN FRESH WATER SYSTEMS: AN ESTIMATE FOR THE YIELD OF ATMOSPHERIC N2O ASSOCIATED WITH DISPOSAL OF HUMAN WASTE
W. A. Kaplan, J. W. Elkins, C. E. Kolb (Aerodyne Research, Inc., Bedford, Mass.), M. B. McElroy, S. C. Wofsy, and A. P. Duran Aug. 1977 40 p refs
(Contract NASw-2952; Grant NSF ENV-76-24239)
(NASA-CR-153978) Avail: NTIS HC A03/MF A01 CSCL 13B

The N2O content of waters in the Potomac and Merrimack Rivers was measured on a number of occasions over the period April to July 1977. The concentrations of dissolved N2O exceeded those which would apply in equilibrium with air by factors ranging from about 46 in the Potomac to 1.2 in the Merrimack. Highest concentrations of dissolved N2O were associated with sewage discharges from the vicinity of Washington, D. C., and analysis indicates a relatively high yield, 1.3 to 11%, for prompt conversion of waste nitrogen to N2O. Measurements of dissolved N2O in fresh water ponds near Boston demonstrated that aquatic systems provide both strong sources and sinks for atmospheric N2O.
Author

N77-30643*# Rhode Island Univ., Kingston. Ocean Engineering Dept.
DEVELOPMENT AND APPLICATION OF A THREE DIMENSIONAL NUMERICAL MODEL FOR PREDICTING POLLUTANT AND SEDIMENT TRANSPORT USING AN EULERIAN-LAGRANGIAN MARKER PARTICLE TECHNIQUE Interim Report
Danny L. Pavish and Malcolm L. Spaulding Jul. 1977 233 p refs
(Grant NsG-1008)
(NASA-CR-153986) Avail: NTIS HC A11/MF A01 CSCL 13B

A computer coded Lagrangian marker particle in Eulerian finite difference cell solution to the three dimensional incompressible mass transport equation, Water Advective Particle in Cell Technique, WAPIC, was developed, verified against analytic solutions, and subsequently applied in the prediction of long term transport of a suspended sediment cloud resulting from an instantaneous dredge spoil release. Numerical results from WAPIC were verified against analytic solutions to the three dimensional incompressible mass transport equation for turbulent diffusion and advection of Gaussian dye releases in unbounded uniform and uniformly sheared uni-directional flow, and for steady-uniform plug channel flow. WAPIC was utilized to simulate an analytic solution for non-equilibrium sediment dropout from an initially vertically uniform particle distribution in one dimensional turbulent channel flow.
Author

N77-30644*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
AIRBORNE URBAN/SUBURBAN NOISE MEASUREMENTS AT 121.5/243 MHz
Ralph E. Taylor and James S. Hill (RCA Service Co., Springfield, Va.) Jul. 1977 13 p refs Presented at 1977 IEEE Intern. Symp. on Electromagnetic Compatibility, Seattle, 2-4 Aug. 1977
(NASA-TM-X-71372; X-952-77-109) Avail: NTIS HC A02/MF A01 CSCL 13B

An airborne measurement of the terrestrial, radio-frequency (RF) noise environment over U.S. metropolitan urban/suburban areas has been made at the 121.5/243 MHz emergency-distress search and rescue (S&R) communications frequencies. Profile contour plots of antenna-noise temperature for U.S.A. East Coast and mid-west urban/suburban areas is presented for daytime/nighttime observations at 121.5/243 MHz. These plots are helpful for compiling radio-noise environment maps; in turn useful for designing satellite-aided, emergency-distress search and rescue communication systems.
Author

N77-30645# California Univ., Livermore. Lawrence Livermore Lab.
ENVIRONMENTAL EFFECTS OF ENERGY PRODUCTION AND UTILIZATION IN THE US. VOLUME 1: SOURCES, TRENDS AND COSTS OF CONTROL

Herbert W. Newkirk, comp. 1 May 1976 481 p refs
(Contract W-7405-eng-48)
(UCRL-51930-Vol-1) Avail: NTIS HC A21/MF A01

Sources of pollution (what the emissions are and where they come from), trends (quantities of emissions and their dispersion with time), and costs of control (what it takes in time, energy, and money to meet minimum standards) are considered. Sections dealing with the atmosphere, water, land, and social activities are included. ERA

N77-30646# Colorado State Univ., Fort Collins. Dept. of Atmospheric Science.
AEROSOL IN THE GATE AREA AND ITS RADIATIVE PROPERTIES
K. Ya. Kondratyev, O. D. Barteneva, L. I. Chapursky, A. P. Chernenko, V. S. Grishechkin, L. S. Ivlev, V. A. Ivanov, V. I. Korzov, V. B. Lipatov, M. A. Prokofyev et al Jun. 1976 123 p refs Prepared by Leningrad (A. A. Zhdanov) State Univ.
(Grant NOAA-04-6-158-44036)
(PB-265264/2; Paper-247; NOAA-77020207;
ISSN-0067-0340) Avail: NTIS HC A06/MF A01 CSCL 13B

Preliminary results of a research program conducted by Main Geophysical Observatory scientists during the GARP Atlantic Tropical Experiment were outlined. Origin and characteristic features of the dust layer were studied. Inferences of microphysical and optical characteristics of the dust aerosol made from ship data are presented. Chemical analyses of aerosols showed a high content of metals. GRA

N77-30647# Stanford Research Inst., Menlo Park, Calif.
DETERMINATION OF SUBPICOGRAM AMOUNTS OF CHEMICAL AGENTS IN THE ATMOSPHERE, PHASE 2 Final Report, May 1975 - May 1976
Gilbert A. StJohn and Michael Anbar Feb. 1977 97 p refs
(Contract DAAA15-75-C-0132)
(AD-A039146; EC-CR-76094) Avail: NTIS HC A05/MF A01 CSCL 15/2

During the second phase of this project, reported here, the objectives were to verify the sensitivity and determine the practical limits of field ionization detection of specific chemical warfare agents by a cross calibration procedure, to determine the usefulness of multiple silicon rubber membrane separators for preenrichment of the analyzed air, and to search for improved field ionization sources. Field ionization mass spectrometry was found to be an adequate technique for the detection of chemical warfare agents in pure air down to the 10 ppt level. In laboratory air, the limit is 1 ppb because of the presence of impurities. This limitation could be eliminated by prepurification of the air. GRA

N77-30648# Environmental Sciences Research Lab., Research Triangle Park, N.C. Meteorology and Assessment Div.
DIURNAL VARIATIONS IN TRAFFIC FLOW AND CARBON MONOXIDE CONCENTRATIONS Report for Mar. 1976 - Feb. 1977
Gerard A. DeMarrais Apr. 1977 60 p refs
(PB-266743/4; EPA-600/4-77-016) Avail: NTIS HC A04/MF A01 CSCL 13B

Comparisons of data for the 36 CO monitoring stations show correlations which vary from large positive to large negative. However, eliminating a few monitoring stations which show relatively poor correlation yields groups within each state that have consistent patterns. The diurnal variations in CO concentrations are not well correlated with traffic patterns. Part of the poor correlation appears to be due to the diurnal variations in vertical mixing and wind speeds and part to the exposures and locations of the sampling instruments. GRA

N77-30649# GCA Corp., Bedford, Mass. GCA Technology Div.
NATIONAL ASSESSMENT OF THE URBAN PARTICULATE PROBLEM. VOLUME 7: WASHINGTON, D. C. Final Report
David A. Lynn, Becky S. Epstein, and Frank Record Jun. 1976 79 p refs
(Contract EPA-68-02-1376)
(PB-267087/5; GCA-76-25-G(7); EPA-450/3-76-026e) Avail: NTIS HC A05/MF A01 CSCL 13B

An overall assessment of the particulate problem is presented. This particular document is one of fourteen single-area volumes that provide working summaries of data gathered in the fourteen urban areas studied. GRA

N77-30650# State Univ. of New York, Syracuse. Coll. of Environmental Science and Forestry.
MUNICIPAL ENVIRONMENTAL CONSERVATION COMMISSIONS IN NEW YORK STATE Ph.D. Thesis
James E. Kundell 4 May 1977 400 p refs Sponsored by US Forest Service
(PB-266874/7) Avail: NTIS HC A17/MF A01 CSCL 13B

Municipal environmental conservation commissions in New York State were studied to ascertain their viability as a means of protecting the local environmental quality. Municipal socioeconomic information was obtained from the 1970 census and land use information was extracted from the Land Use and Natural Resources study. A telephone interview was conducted with 100 commission members and 26 mayors and town supervisors. Statistical analysis of the data was conducted on a CDC 3200 computer utilizing subprograms from the Statistical Package for the Social Sciences. The data substantiated that conservation commissions are a viable means of protecting the local environment. Factors influencing commissions' success include: leadership, membership, perceivable environmental problems, communications, informational resources, the mode of operation of the commission, and the relationship established with the decision-making body. GRA

N77-30651# Control Data Corp., Minneapolis, Minn.
AN OBJECTIVE ANALYSIS TECHNIQUE FOR THE REGIONAL AIR POLLUTION STUDY, PART 2 Final Report
D. Hovland, D. Dartt, and K. Gage Feb. 1977 59 p refs
(Contract EPA-68-02-1827)
(PB-266756/6; EPA-600/4-77-002b) Avail: NTIS HC A04/MF A01 CSCL 04A

The application of objective analysis techniques to the computation of trajectories from surface wind observations are discussed. Trajectories were computed over a 100 kilometer square grid centered on St. Louis for two 5-hour periods during July 1975. The variability of the surface wind field was investigated by examining the temporal and spatial variability of computed trajectories. Also, the sensitivity of the computed trajectories to the amount of data employed in the analysis was examined in some detail. The results showed a general lack of sensitivity of the computed trajectories to a single missing observation. GRA

N77-30652# Environmental Protection Agency, Washington, D.C. Grants Administration Div.
STATE MUNICIPAL PROJECT PRIORITY LIST FOR CONSTRUCTION GRANTS FOR WASTEWATER TREATMENT WORKS. PUBLIC LAW 92-500
18 Apr. 1977 145 p
(PB-266901/8; EPA-GAD/3-77-001) Avail: NTIS HC A07/MF A01 CSCL 13B

Records for municipal wastewater treatment works projects assigned priority by the States and planned for funding by the Environmental Protection Agency are published. Data was sorted first by region then by state and status. Project records were listed in ascending order of the grant number. Each entry includes: grant number, step, applicant name, date application is expected/received, project status, date project is awarded funds/completed, amount requested from/awarded and the priority rank assigned by the State. GRA

N77-30653# Environmental Sciences Research Lab., Research Triangle Park, N.C. Meteorology and Assessment Div.
CALCULATION OF SELECTED PHOTOLYTIC RATE CONSTANTS OVER A DIURNAL RANGE. A COMPUTER ALGORITHM
Kenneth L. Schere and Kenneth L. Demerjian Mar. 1977 73 p refs
(PB-266739/2; EPA-600/4-77-015) Avail: NTIS HC A04/MF A01 CSCL 07D

A computer program was created and is described which employs the theoretical formulation of the photolytic rate constant to calculate these rate constants for specific chemical species over a diurnal time period in clear sky conditions. A user of the

program must specify the date, time and location for which the rate constants are desired. With the information and specific data on zenith angles, solar irradiance, and species characteristics of absorption cross sections and primary quantum yields, which are provided in the program package, the computer program generates a diurnal range of photolytic rate constants for each species. GRA

N77-30654# Argonne National Lab., Ill. Energy and Environmental Systems Div.
DEVELOPMENT OF COMPUTERIZED EMISSION PROJECTION AND ALLOCATION SYSTEM. PHASE 1: PRELIMINARY FEASIBILITY STUDY Final Report
Richard R. Cirillo and Michael J. Senew Dec. 1976 111 p refs
(PB-266947/1; EPA-450/3-77-001) Avail: NTIS HC A06/MF A01 CSCL 13B

The need for a computerized emission projection and allocation (CEPA) system was assessed. The primary application of the system would be the computerization of otherwise long and tedious calculations required to properly assess growth and development when considering the maintenance of the national ambient air quality standards. Seven air pollution control agencies and two local and regional planning organizations were interviewed as potential users of such a system. GRA

N77-30655# Monsanto Research Corp., Dayton, Ohio.
SOURCE ASSESSMENT: PHTHALIC ANHYDRIDE (AIR EMISSIONS) Final Report, Jan. 1975 - Apr. 1976
R. W. Serth and T. W. Hughes Dec. 1976 160 p refs
(Contract EPA-68-02-1874)
(PB-266797/0; EPA-600/2-76-032d) Avail: NTIS HC A08/MF A01 CSCL 07A

Results are given of an analysis of atmospheric (air) emissions from ortho-xylene-and naphthalene-based phthalic anhydride manufacturing plants. Uncontrolled and controlled emission factors are given for each species emitted to the atmosphere from each source within a typical plant, based on the latest data available. Emissions data are used to calculate three factors designed to quantify the hazard potential of the emissions: (1) source severity (the ratio of maximum mean ground-level concentration of a pollutant to the concentration which constitutes an incipient health hazard), (2) the industry contribution to total atmospheric emissions of criteria pollutants, and (3) the population exposed to high contaminant levels from a representative plant. Detailed process descriptions and flow sheets are presented for the BASF fixed-bed ortho-xylene process and the Badger-Sherwin-Williams fluid-bed naphthalene process. Present and future aspects of pollution control technology in the industry are discussed. GRA

N77-30656# Westinghouse Research Labs., Pittsburgh, Pa.
SORBENT SELECTION FOR THE CAFB RESIDUAL OIL GASIFICATION DEMONSTRATION PLANT Final Task Report, Apr. 1975 - Mar. 1976
E. P. Oneil, D. L. Keairns, and M. A. Alvin Mar. 1977 29 p refs
(Contract EPA-68-02-2142)
(PB-266827/5; EPA-600/7-77-029) Avail: NTIS HC A03/MF A01 CSCL 07A

Evaluations of limestone from Texas and Mexico as candidate sulfur sorbents for the chemically active fluid-bed gasification demonstration plant at San Bonito, Texas, are reported. Preliminary laboratory tests show that three of the limestones quarried should be suitable sorbents, based on availability, chemical characterization, physical characterization, attrition behavior, and chemical reactivity as sulfur sorbents. GRA

N77-30657# Bureau of Mines, Spokane, Wash. Spokane Mining Research Center.
PHYSICAL PROPERTIES OF WESTERN COAL WASTE MATERIALS
R. R. Backer, R. A. Busch, and L. A. Atkins 1977 36 p refs
(PB-266724/4; BM-RI-8216) Avail: NTIS HC A03/MF A01 CSCL 08I

The relatively cleaner product from the predominance of surface mining and occurrence of thicker seams in the West reduces the amount of coal preparation required and the size of the waste piles. Because of the abundance of land available for waste disposal, many of the piles are low and extended over large areas. New concepts relating statistical shear strength data to liquifaction potential are presented. GRA

N77-30658# Vanderbilt Univ., Nashville, Tenn.
FOAM FLOTATION TREATMENT OF HEAVY METALS AND FLUORIDE-BEARING INDUSTRIAL WASTEWATERS Final Report
David J. Wilson Apr. 1977 90 p refs
(Grant EPA-R-803564)
(PB-267549/4; EPA-600/2-77-072) Avail: NTIS HC A05/MF A01 CSCL 07A

Laboratory studies demonstrated that the floc foam flotation techniques are effective in removing lead, cadmium, mercury, copper, zinc, arsenic, and fluoride from dilute wastewaters to very low levels. Flotation column simulator computer program was also constructed. Floc foam flotation techniques were not suitable for treatment of wastes containing high concentrations of dissolved salts and adequate pH control was essential in most separations. Foam separation processes combine the attractive features of simplicity, economy, potential for recovery, and effective removal of pollutants at low concentrations in wastewaters. GRA

N77-30659# Rockwell International Corp., Canoga Park, Calif.
PROTOTYPE SYSTEMS FOR PLUGGING LEAKS IN RUPTURED CONTAINERS Final Report
J. J. Vrolyk, R. C. Mitchell, and R. W. Melvold Dec. 1976 110 p refs
(Contract EPA-68-03-0234)
(PB-267245/9; EPA-600/2-76-300; R-9659) Avail: NTIS HC A06/MF A01 CSCL 13B

A prototype system for temporarily stopping the flow of hazardous materials spilling on land or underwater from ruptured or damaged containers was developed. The system is portable, integrated, and field operationable by one man. It uses foamed-in-place polyurethane rigid foam plugs surrounded by a flexible protective membrane. Development has progressed to the point that it is now realistic to project practical field use of the system. GRA

N77-30660# Environmental Research Lab., Athens, Ga. Analytical Chemical Branch.
NONDESTRUCTIVE MULTIELEMENT INSTRUMENTAL NEUTRON ACTIVATION ANALYSIS
Robert V. Moore and Oliver W. Propheter Feb. 1977 25 p refs
(PB-267283/0; EPA-600/4-77-011) Avail: NTIS HC A02/MF A01 CSCL 13B

A nondestructive instrumental neutron activation analysis procedure was developed which permitted accurate and sensitive measurement of most elements with atomic numbers between 11 and 92. The sensitivity of the procedure was dependent on each element's intrinsic characteristics and the sample matrix. Agreement of within 20% was shown with available comparison data in all elements but antimony, zinc, and a few trace elements whose differences ranged from 50% upward. GRA

N77-30661# National Bureau of Standards, Washington, D. C. Heat Div.
THERMOMETRY IN THE CONTROL OF WATER QUALITY Final Report
Sharrill D. Wood May 1977 22 p refs
(PB-267608/8; NBSIR-77-1227) Avail: NTIS HC A02/MF A01 CSCL 13B

Thermometry in water pollution was studied. The report focused on water analysis; thermal pollution, and the work of standards committees. It was concluded that the current needs in this field can be addressed most efficiently by the National Bureau of Standards with educational and calibration activities. Suggestions were made concerning possible contribution by NBS with an emphasis on those activities having large impacts for small investments of NBS resources. GRA

N77-30662# Michigan Univ., Ann Arbor. Dept. of Environmental and Industrial Health.
GASEOUS EMISSIONS FROM UNREGULATED MOBILE

SOURCES Final Report
Donald E. Zinger and Lawrence H. Hecker Oct. 1976 291 p refs
(Grant EPA-R-803568-01-0)
(PB-267551/0) Avail: NTIS HC A13/MF A01 CSCL 13B

The impact of gaseous emissions are determined for unregulated mobile sources; farm equipment, merchant vessels, locomotives, lawn and garden tools, snowmobiles, outboard motors, and transport refrigeration units. All but farm equipment and snowmobiles appear to have negligible impact on total air burden. Future impact of these sources in certain areas are discussed. The current emission rates of each category are tabulated and compared to other emissions from both mobile and stationary sources in the study area. GRA

N77-30663# Environmental Monitoring and Support Lab., Las Vegas, Nev.
AIR QUALITY DATA FOR THE NORTHEAST OXIDANT TRANSPORT STUDY, 1975 Final Report
G. W. Siple, C. K. Fitzsimmons, J. J. VanEe, and K. F. Zeller Mar. 1977 106 p refs
(PB-267545/2; EPA-600/4-77-020) Avail: NTIS HC A06/MF A01 CSCL 13B

A survey was conducted in the northeastern region of the U.S. to assess the transport of oxidant and oxidant precursors through the area. A description of the monitoring system, considerations involved in the operation of the system, and a presentation of the data collected by the system are included. GRA

N77-30664# Environmental Protection Agency, Ann Arbor, Mich. Mobile Source Pollution Control Program.
TRADEOFFS ASSOCIATED WITH POSSIBLE AUTO EMISSION STANDARDS Final Report
1975 40 p refs
(PB-267571/8) Avail: NTIS HC A03/MF A01 CSCL 13B

Five scenarios depict estimated results of five different actions the Administrator may undertake. For each scenario, estimates were made for the type of emission control systems that would be used to meet the standards, the customer first cost of these systems, the fuel economy of a typical car using these control systems and the sulfate emission levels the car would produce. All factors shown are for the 1974 through 1980 model years. GRA

N77-30665# Environmental Protection Agency, Washington, D.C. Office of Water Supply.
NATIONAL INTERIM PRIMARY DRINKING WATER REGULATIONS
1976 163 p refs
(PB-267630/2; EPA-570/9-76-003) Avail: NTIS HC A08/MF A01 CSCL 13B

Interim primary regulations for radioactivity in drinking water were promulgated. These regulations become in essence the standards by which all public drinking water supplies are judged. GRA

N77-30666# Midwest Research Inst., Kansas City, Mo.
DEVELOPMENT OF HATREMS DATA BASE AND EMISSION INVENTORY EVALUATION Final Report, Jul. 1976 - Mar. 1977
Christine M. Maxwell, Russell Bohn, Roger Caiazza, and Chatten Cowherd, Jr. Apr. 1977 213 p refs
(Contract EPA-68-02-2390)
(PB-267634/4; EPA-450/3-77-01) Avail: NTIS HC A10/MF A01 CSCL 13B

HATREMS is a computerized subsystem of EPA's AEROS. HATREMS stores and reports source and emission data for non-criteria pollutants in a manner parallel to NEDS which stores and reports data for the five criteria pollutants. Three hazardous pollutants (lead, fluorides, and HCl/chlorine) were selected from a list of nine pollutants for incorporation as separate chapters into 'Emission Factors for Trace Subtances'. These special report chapters are included as appendices to this report. GRA

N77-30667# Louisiana State Univ., Baton Rouge. Center for Wetlands Resources.
PROCEEDINGS OF THE INTERNATIONAL SYMPOSIUM ON MARINE POLLUTION RESEARCH Final Report
Samuel P. Meyers Jan. 1976 177 p refs Proc. held at Gulf Breeze, Fla., 27-29 Jan. 1976
(Grant EPA-R-803141-01-0)
(PB-267601/3; EPA-600/9-76-032; ERL-GB-324) Avail: NTIS HC A09/MF A01 CSCL 13B

Subjects included are: Responsibilities for marine pollution research within Federal agencies of the United States; Overview of marine pollution research in the Baltic; Marine pollution research in Yugoslavia; Overview of marine pollution research in Egypt; Overview on pollution in the coastal environment of Pakistan and its possible implication for the marine ecosystem; Overviews on marine pollution in India; Research needs concerning pollution of the marine benthos; Hydrological, chemical and physical processes affecting pollution of the Baltic Sea; Investigation of pollution-stressed littoral communities in the Northern Adriatic; Microbiology and chemistry of estuarine surface microlayers; Survival of viruses in the marine environment; Relationship of marine pollution to human health; and Bioassays as indicators of pollution effects. GRA

46 GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism.

For space radiation see *93 Space Radiation*.

N77-30668 State Univ. of New York, Stony Brook.
MODEL STUDIES OF THE NATURAL AND PERTURBED STRATOSPHERE Ph.D. Thesis
Murali Natarajan 1976 107 p
Avail: Univ. Microfilms Order No. 77-7785

The chemical structure of the earth's stratosphere and its response to external perturbations have been studied. A time dependent, one dimensional model of the stratosphere was developed. This model incorporated a detailed chemical reaction scheme involving various species that were known to be present in the stratosphere. The model was used as the initial condition for the perturbation studies. The type of the perturbations considered involved the injection of nitrogen oxides at a given altitude. Results indicate a definite decrease in the ozone column density due to NO(x) injection. Dissert. Abstr.

N77-30669 Ohio State Univ., Columbus.
PROBABILISTIC AND DETERMINISTIC ASPECTS OF LINEAR ESTIMATION IN GEODESY Ph.D. Thesis
Athanasios Dermanis 1976 173 p
Avail: Univ. Microfilms Order No. 77-10515

The mathematical and probabilistic background of standard linear estimation techniques used in geodesy were clarified and their interrelationship revealed. The norm choice problem in gravimetric collocation and the adaptive determination of the stochastic models for not directly observable physical processes were also addressed. Dissert. Abstr.

N77-30670 Ohio State Univ., Columbus.
ON THE REALIZATION OF A 10cm RELATIVE OCEANIC GEOID Ph.D. Thesis
Demosthenes Christodoulidis, C. 1976 105 p
Avail: Univ. Microfilms Order No. 77-10508

The theoretical and numerical problems associated with the computation of a 10 cm relative oceanic geoid was investigated. Based on a model which requires potential coefficients and gravity anomaly information for the computation of geoidal undulations, an error analysis was developed through which the necessary data requirements for the realization of such a high accuracy geoid were derived. To ensure the validity of the Stokes integral to the required level of accuracy, seasonal and latitude dependent atmospheric corrections to the gravity and height anomalies were developed. From these corrections it was deduced that when the combined latitudinal/seasonal dependence is neglected, the maximum error introduced is of the order of 40 mu gals for the gravity corrections and 0.7 cm for the height anomaly corrections. Dissert. Abstr.

N77-30671 Pennsylvania State Univ., University Park.
DETERMINATION OF SEISMIC SOURCE PARAMETERS USING FAR-FIELD SURFACE WAVE SPECTRA Ph.D. Thesis
Lawrence Sturtevant Turnbull, Jr. 1976 453 p
Avail: Univ. Microfilms Order No. 77-9607

Far-field surface wave amplitude spectra have been studied for their use in determining seismic source parameters. Using theoretical spectra generated for a double couple source in a plane layered half-space, the minimum residual fit to the observed spectra was obtained, yielding source parameter estimates. In order to develop procedures for obtaining improved surface wave magnitude estimates, various combinations of surface wave spectra for the fundamental and first higher mode were examined, using a double couple source, to assess invariance with respect to source parameter variations. Dissert. Abstr.

N77-30672 Pennsylvania State Univ., University Park.
SYSTEM GEOMETRY AND THE INTERPRETATION OF SODAR DATA Ph.D. Thesis
Richard Lincoln Coulter 1976 184 p
Avail: Univ. Microfilms Order No. 77-9543

The peak and halfwidth of the spectrum were defined in terms of the intersection of the transmitter and receiver beams in space. The variation of peaks and halfwidth is derived as a funtion of the system parameters. They are found to have a marked height dependence, and two sign reversals as the common volume is traversed. The halfwidths determined in this way show the spectra to be highly asymmetric in the first and last parts of the volume. The inclusion of wind shear causes the peak vs. height curves to change dramatically and may cause a narrowing of the spectrum at intermediate ranges. The characteristics and initial use of the Penn State sodar system are discussed and data obtained with it, including correction for the system function variations, which are compared with double-theodolite wind profile measurements. Dissert. Abstr.

N77-30673 New Hampshire Univ., Durham.
A DETERMINATION OF CONVECTIVE ELECTRIC FIELDS THROUGH IN SITU MEASUREMENTS OF THE IONOSPHERIC F-REGION THERMAL ION SPECTRA Ph.D. Thesis
Barry Gene Morgan 1976 206 p
Avail: Univ. Microfilms Order No. 77-10262

A detector package designed to measure the bulk flow of heavy ions was developed for rocket studies of the lower ionosphere. From direct measurements of the particles' thermal energy spectra, estimates of the rocket payload potential, ion density, ion temperature, and bulk plasma flow can be obtained. By interpreting the bulk flow velocity transverse to the local magnetic field as convective drift it is possible to infer the strengths of convective electric fields. The technique of data analysis involves least-squares fitting a shifted, drifting Maxwellian distribution to the differential energy spectra measured by detectors looking parallel and perpendicular to the rocket's spin axis. Dissert. Abstr.

N77-30674 Tennessee Univ., Knoxville.
AN INVESTIGATION OF THE TEMPORAL CHARACTER OF MESOSCALE PERTURBATIONS IN THE TROPOSPHERE AND STRATOSPHERE Ph.D. Thesis
William Walton Vaughan 1976 134 p
Avail: Univ. Microfilms Order No. 77-10813

The effectiveness of mesoscale models in explaining perturbations observed in vertical detailed wind profile measurements in the troposphere and lower stratosphere was assessed. The structure and persistence of the data were analyzed and interpreted in terms of several physical models with the goal of establishing explanations for the observed persistent features of the mesoscale flow patterns. The experimental data used in the investigation were obtained by a unique detailed wind profile measurement system. This system is capable of providing resolution of 50- to 100-m wave lengths for the altitude region from about 200 m to 18 km. The system consists of a high resolution tracking radar and special super pressure balloon configuration known as a Jimsphere. Dissert. Abstr.

N77-30675 Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
AN EVALUATION OF MASS INTEGRAL SCALING AS APPLIED TO THE ATMOSPHERIC RADIATION TRANSPORT PROBLEM Ph.D. Thesis
Raymond Alfred Shulstad 1976 198 p
Avail: Univ. Microfilms Order No. 77-9476

Results of a comprehensive evalution of mass integral scaling as applied to the atmospheric radiation transport problem were presented. An approximation was used to predict the free field radiation environments from atmospheric nuclear detonations. Codes used mass integral scaling of infinite homogeneous air transport data to generate environments which purport to reflect the near exponential vertical variation in density of air. The validity of the approximation was evaluated. Dissert. Abstr.

N77-30676 Pennsylvania State Univ., University Park.
A STUDY OF WATER VAPOR MEASUREMENT IN THE STRATOSPHERE AND MESOSPHERE USING MICROWAVE TECHNIQUES Ph.D. Thesis
Richard L. Longbothum 1976 416 p
Avail: Univ. Microfilms Order No. 77-9697

An investigation of water vapor measurement in the stratosphere and mesosphere using both the 22 and 183 GHz spectral lines in emission and absorption is accomplished. A spherically stratified earth atmospheric model is incorporated including the Voight line shape for resonant lines, five water vapor density profiles ranging from one to ten parts per million, and the effects of other atmospheric gases and refraction. A design study of a microwave radiometer capable of extremely high spectral resolution (100 KHz) is presented and used to simulate both upward- and outward-looking balloon experiments, as well as a limb-viewing experiment performed from a satellite in a 200 km orbit. Dissert. Abstr.

N77-30677*# TRW Systems Group, Redondo Beach, Calif.
PLASMA PHYSICS AND ENVIRONMENTAL PERTURBATION LABORATORY. VOLUME 1: EXECUTIVE SUMMARY Final Report
9 Nov. 1973 22 p
(Contract NAS8-28047)
(NASA-CR-150364; TRW-21390-6017-RU-00-Vol-1) Avail: NTIS HC A02/MF A01 CSCL 04A

Space physics and plasma physics experiments that can be performed from the space shuttle were identified. Potential experiment concepts were analyzed to derive requirements for a spaceborne experiment facility. The laboratory, known as the Plasma Physics and Environmental Perturbation Laboratory consists of a 33-foot pallet of instruments connected to a 25-foot pressurized control module. Two 50-meter booms, two subsatellites, a high power transmitter, a multipurpose accelerator array, a set of deployable canisters, and a gimbaled instrument platform are the primary systems deployed from the pallet. The pressurized module contains all the control and display equipment required to conduct the experiments, and life support and power subsystems. Author

N77-30678*# TRW Systems Group, Redondo Beach, Calif.
PLASMA PHYSICS AND ENVIRONMENTAL PERTURBATION LABORATORY. VOLUME 2: TECHNICAL REPORT Final Report
24 Aug. 1977 136 p
(Contract NAS8-28047)
(NASA-CR-150365; TRW-21390-6017-RU-00-Vol-2) Avail: NTIS HC A07/MF A01 CSCL 04A

For abstract, see N77-30677.

N77-30679*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ATMOSPHERIC OZONE MEASUREMENTS MADE FROM B-747 AIRLINERS: SPRING 1975
P. D. Falconer (NOAA Air Resources Lab., Silver Spring, Md.), J. D. Holdeman (NOAA Air Resources Lab., Silver Spring, Md.), and A. D. Taylor 17 Aug. 1976 17 p refs Presented at the Joint Symp. on Atmospheric Ozone, Dresden, 9-17 Aug. 1976; cosponsored by Intern. Assoc. of Meteorology and Atmospheric Phys., the World Meteorol. Organ., and the Intern. Assoc. of Geomagnetism and Aeronomy
(NASA-TM-X-73675) Avail: NTIS HC A02/MF A01 CSCL 04A

Atmospheric ozone in the upper troposphere and lower stratosphere north of the equator has been registered aboard two commercial B-747 airliners. The composite ozone, flight and meteorological data are reported. Attention is drawn particularly to the vertical profiles of atmospheric ozone mixing ratio as a function of both distance from the tropopause and curvature of the streamlines. The GASP observations suggest that ozone levels typical of the lower stratosphere are often embedded in the upper troposphere, principally during occassions when cyclonic wind curvature was noted. Author

N77-30680*# Kanner (Leo) Associates, Redwood City, Calif.
THE RELATION BETWEEN ISOTOPIC COMPOSITION OF ARGON AND CARBON IN NATURAL GASES
Y. Y. Gavrilov, Yu. A. Zhurov, and G. I. Teplinskiy Washington NASA Jul. 1977 10 p refs Transl. into ENGLISH from Dokl. Akad. Nauk SSSR, Geokhimiya (USSR), v. 206, no. 2, 1972 p 448-451
(Contract NASw-2790)
(NASA-TM-75134) Avail: NTIS HC A02/MF A01 CSCL 08G

The methods and results of determination of the argon and carbon isotope compositions of hydrocarbon gases of Mezozoic complexes of Western Siberia are presented. Based on the Ar-36, Ar-40, C-12, C-13 content of the various deposits and on the presumed mechanisms of entry of these isotopes into the deposits, it is concluded that formation of natural gas in some deposits included vertical migration from a lower complex. Author

N77-30681*# National Aeronautics and Space Administration. Goddard Inst. for Space Studies, New York.
FAULTING PARAMETERS DERIVED FROM COMPUTER SIMULATION OF EARTHQUAKES
Steven C. Cohen Jun. 1977 29 p refs Submitted for publication
(NASA-TM-X-71361; X-921-77-142) Avail: NTIS HC A03/MF A01 CSCL 08K

Seismic source parameters, average displacement, rupture length, and strain energy release are investigated by computer simulation using a coupled massive block model of the sliding along an active fault. Average displacements and energy release vary considerably with the degree of heterogeneity in the friction and elastic parameters used in the model. Strain energy release is determined primarily by the product of dynamic friction, rupture length, and average displacement. Interrelationships among the faulting parameters are consistent with theoretical arguments and experimental data. The variation in the frequency of occurrence of simulation events with strain energy release is different from the variation in the frequency of naturally occurring events with seismic energy. Author

N77-30682*# National Aeronautics and Space Administration. Goddard Inst. for Space Studies, New York.
EARLY IMPACT BASINS AND THE ONSET OF PLATE TECTONICS Ph.D. Thesis - Maryland Univ.
Herbert Frey Jul. 1977 32 p refs Submitted for publication
(NASA-TM-X-71369; X-922-77-172) Avail: NTIS HC A03/MF A01 CSCL 08F

The fundamental crustal dichotomy of the Earth (high and low density crust) was established nearly 4 billion years ago. Therefore, subductable crust was concentrated at the surface of the Earth very early in its history, making possible an early onset for plate tectonics. Simple thermal history calculations spanning 1 billion years show that the basin forming impact thins the lithosphere by at least 25%, and increases the sublithosphere thermal gradients by roughly 20%. The corresponding increase in convective heat transport, combined with the highly fractured nature of the thinned basin lithosphere, suggest that lithospheric breakup or rifting occurred shortly after the formation of the basins. Conditions appropriate for early rifting persisted from some 100,000,000 years following impact. We suggest a very early stage of high temperature, fast spreading 'microplate' tectonics, originating before 3.5 billion years ago, and gradually stabilizing over the Archaean into more modern large plate or Wilson Cycle tectonics. Author

N77-30683*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
MAGSAT: A SATELLITE FOR MEASURING NEAR EARTH MAGNETIC FIELDS
R. A. Langel, R. D. Regan (Geol. Survey, Reston, Va.), and J. P. Murphy (NASA, Washington) Jul. 1977 21 p refs Presented at 3rd Gen. Sci. Assembly of the Intern. Assoc. of Geomag. and Aeronomy, Seattle, 22 Aug. - 3 Sep. 1977
(NASA-TM-X-71370; X-922-97-199) Avail: NTIS HC A02/MF A01 CSCL 08N

Magsat, designed for making measurements of the geomagnetic vector field, is evaluated. For accurate vector measurements the attitude of the fluxgate magnetometer will be determined to about 15 arc-seconds. Expected measurement accuracy will be 6 (gamma) in each component and 3 in magnitude. The Magsat data will be applied to solid earth studies including modeling of the Earth's main magnetic field, delineation of regional magnetic anomalies of crustal origin, and interpretation of those anomalies in terms of geologic and geophysical models. An opportunity will be presented to the scientific community to participate in data use investigations. Author

N77-30684*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SIMULATION OF RADIATION FROM LIGHTNING RETURN STROKES: THE EFFECTS OF TORTUOSITY
David M. Levine and Robert Meneghini [1977] 32 p refs Submitted for publication
(NASA-TM-X-71371; X-953-77-154) Avail: NTIS HC A03/MF A01 CSCL 04A

A Monte Carlo simulation has been developed for the electromagnetic fields radiated from a tortuous lightning channel. This was done using a piecewise linear model for the channel and employing for each element the field radiated by a traveling wave on an arbitrarily oriented filament over a conducting plane. The simulation reproduces experimental data reasonably well and had been used to study the effects of tortuousity on the fields radiated by return strokes. Tortuosity can significantly modify the radiated waveform, tending to render it less representative of the current pulse and more nearly unipolar than one would expect based on the theory for a long straight channel. In the frequency domain the effect of tortuosity is an increase in high frequency energy as compared with an equivalent straight channel. The extent of this increase depends on the mean length of the elements comprising the channel and can be significant. Author

N77-30685# Commonwealth Scientific and Industrial Research Organization, Aspendale (Australia). Div. of Atmospheric Physics.
CONVECTION MECHANISMS OF ATMOSPHERIC HEAT TRANSFER FROM SURFACE TO GLOBAL SCALES
E. K. Webb Feb. 1977 18 p refs Presented at 2d Australasian Conf. on Heat and Mass Transfer, Sydney, Feb. 1977 p 523-539
Avail: NTIS HC A02/MF A01

The dry convection processes which participate in the transfer of sensible and latent heat in the atmosphere were studied. In the surface layer, the structure of the upward transfer processes is related to height scaled to Obukov's length L. For z/absolute value of $L < 0.03$, wind shear generated forced convection is dominant. For $0.03 < z/$ absolute value of $L < 2$, the convection is of a composite type involving both wind shear turbulence and buoyancy; thermal plumes appear, but mostly do not reach the upper parts of this height range. Author

N77-30686*# Smithsonian Astrophysical Observatory, Cambridge, Mass.
GLOBAL CORRELATION OF TOPOGRAPHIC HEIGHTS AND GRAVITY ANOMALIES
M. C. Roufosse 24 May 1977 52 p refs
(Grant NGR-09-015-002)
(NASA-CR-154844; SAO-SR-378) Avail: NTIS HC A04/MF A01 CSCL 08N

The short wavelength features were obtained by subtracting a calculated 24th-degree-and-order field from observed data written in 1 deg x 1 deg squares. The correlation between the two residual fields was examined by a program of linear regression. When run on a worldwide scale over oceans and continents separately, the program did not exhibit any correlation; this can be explained by the fact that the worldwide autocorrelation

function for residual gravity anomalies falls off much faster as a function of distance than does that for residual topographic heights. The situation was different when the program was used in restricted areas, of the order of 5 deg x 5 deg square. For 30% of the world,fair-to-good correlations were observed, mostly over continents. The slopes of the regression lines are proportional to apparent densities, which offer a large spectrum of values that are being interpreted in terms of features in the upper mantle consistent with available heat-flow, gravity, and seismic data. Author

N77-30687*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
CHARGE EXCHANGE LIFETIMES FOR IONS IN THE MAGNETOSPHERE
Paul H. Smith and N. K. Bewtra (Computer Sciences Corp., Silver Spring, Md.) Jun. 1977 37 p refs Submitted for publication
(NASA-TM-X-71381; X-620-77-209) Avail: NTIS HC A03/MF A01 CSCL 04A

Latest and best measurements of physical quantities involved in complete calculation of the charge exchange lifetime of mirroring magnetospheric ions are coalesced and summarized. It is critical that the charge exchange lifetimes for ions be known as accurately as possible in order to apply the charge exchange mechanism to ion phenomena within the earth's magnetosphere. Author

N77-30688# Naval Postgraduate School, Monterey, Calif.
HIGH FREQUENCY IONOSPHERIC PROPAGATION PHENOMENA M.S. Thesis
Richard Robert Rowe Dec. 1976 123 p refs
(AD-A039355) Avail: NTIS HC A06/MF A01 CSCL 20/14

Project Brigham was a Department of Defense data collection effort wherein 890 kHz wide samples of the HF spectrum were acquired using a 25 Hz sampling rate with 2.8 kHz resolution for a period of up to 2.4 minutes. The main thrust of this paper has been the visual examination of the data on a graphics display with the idea of identifying drastic and unexpected changes in either individual signals or the entire wavefront; those changes being due, at least in part, to signal transformation resulting from various ionospheric phenomena. In addition, an in-depth statistical study was conducted on several of the specific signals with the hope of aiding in the formulation of an algorithm to efficiently automate the receiving system's sensitivity settings. Author (GRA)

N77-30689# Cincinnati Univ., Ohio. Dept. of Physics.
RESEARCH IN GRAVITY WAVES AND AIRGLOW PHENOMENA Final Report, 1 Sep. 1973 - 31 Aug. 1976
Tai-Fu Tuan 23 Nov. 1976 100 p refs
(Contract F19628-74-C-0008)
(AD-A040414; AFGL-TR-76-0296) Avail: NTIS HC A05/MF A01 CSCL 04/1

The research in this final report may be divided into three parts. The first part deals with the behavior of airglow (mid-latitude) under the influence of atmospheric gravity wave model is assumed. Our principal objective here is to examine its effect on the ionosphere and the 6300 A OI 5200 A NI emission lines. The second part deals with a new approach for treating gravity waves. The gravity wave problem can be reduced into a multi-channel scattering problem with effective potentials for each channel. The potentials for the gravity channel corresponding to different exospheric temperatures were obtained from the 1972 Cospar models. The third part is an investigation of the non-linear effects of gravity wave on natural oscillations. Airglow (mostly 5577 A OI) oscillations often show a small period (8-14 min.) oscillation superimposed on a long period (approx. hour) oscillation. The short period oscillation is sometimes excited by the long period oscillation as the latter increases in amplitude. GRA

N77-30690# Army Electronics Command, Fort Monmouth, N.J.
EVALUATIONS OF THE NOAA-4 VTPR THERMAL WINDS FOR NUCLEAR FALLOUT PREDICTIONS
Louis D. Duncan and May Ann Seagraves Mar. 1977 53 p refs
(DA Proj. 1T1-62111-AH-71)
(AD-A040417; ECOM-5815) Avail: NTIS HC A04/MF A01 CSCL 18/3

The procedure and theory for determining wind profiles from radiance measurements obtained by vertical temperature profile sounders on polar orbiting meteorological satellites are presented. The use of the wind profiles from 15 to 30 km altitude in the generation of nuclear fallout prediction on the battlefield is discussed. Comparisons of winds obtained with this technique with profiles obtained from radiosonde measurements have been made for 33 sets of data. Results of these comparisons indicate that the winds derived from radiance measurements are sufficiently accurate to satisfy the Army's requirements for wind data, in the 15 to 30 km altitude range, for nuclear fallout prediction. Author (GRA)

N77-30691# Danish Meteorological Inst., Copenhagen. Ionosphere Lab.
[RESEARCH ACTIVITIES OF THE IONOSPHERE LABORATORY] Annual Report, 1975
10 Feb. 1976 16 p refs In DANISH; ENGLISH summary
(B-60) Avail: NTIS HC A02/MF A01

Basic routine measurements at the polar ionosphere from stations in Greenland: Narssarssuaq, Godhavn, Thule, Sdr. Stroemfjord et al, and vertical sounder VLF and riometer recordings were made from about 10 other locations in Greenland, Norway and Faroe Islands. Studies of special ionospheric phenomena based on these measurements especially in the sporadic E-region of the ionosphere, development of unmanned geophysical observatories, and radiocommunication-forecast are reported. Author (ESA)

N77-30692# Illinois Univ., Chicago. Dept. of Materials Engineering.
LABORATORY TRIAXIAL TESTING PROCEDURES TO DETERMINE THE CYCLIC STRENGTH OF SOILS
M. L. Silver Jun. 1977 144 p refs
(Contract AT(11-1)-2433)
(PB-267374/7; NUREG-0031) Avail: NTIS HC A07/MF A01 CSCL 08M

A suggested procedure for the laboratory cyclic triaxial strength test (sometimes called a liquefaction test) is presented. A discussion of acceptable cell features, transducer specifications, signal recording characteristics, and loading equipment performance is included, and minimum performance standards are given. Methods are presented for the preparation of reconstituted soil specimens. In addition, data reduction and presentation methodologies are described. Also presented are the results of a cooperative cyclic triaxial strength test program performed by eight university government and consulting laboratories to define the cyclic strength characteristics of a standard test sand. GRA

N77-30693*# Colorado State Univ., Fort Collins. Dept. of Atmospheric Science.
DESIGN AND EXECUTION OF THE MARINE STRATOCUMULUS EXPERIMENT
Joseph S. Wakefield and Wayne H. Schubert Sep. 1976 81 p refs
(NASA Order GA-31588; Grants NSF ATM-76-09370; NSF OCD-74-21678)
(NASA-CR-153891; PB-266753/3; AS-Paper-256) Avail: NTIS HC A05/MF A01 CSCL 04A

All model unknowns and input parameters using the Electra instrumentation and user supplied instrumentation were measured. Five flights off the California coast were made; each flight lasting approximately six hours. Examples of some of the flight data are shown. GRA

N77-30694# Air Force Geophysics Lab., Hanscom AFB, Mass.
ANALYSIS OF SMOKE TRAIL PHOTOGRAPHS TO DETERMINE STRATOSPHERIC WINDS AND SHEARS Environmental Research Papers
Antonio F. Quesada and C. A. Trowbridge 8 Oct. 1976 35 p
(AD-A035504; AFGL-TR-76-0243; AFGL-ERP-580) Avail: NTIS HC A03/MF A01 CSCL 04/2

Time-lapse photographs of smoke trails deposited in the stratosphere have been measured and analyzed to provide data for the determination of winds and wind shears. Optimization techniques were required to define camera parameters with sufficiently high precision. In combination with a triangulation

program that exploits the advantages of vector and matrix methods, the techniques lead to consistent three-station results that are used to construct wind profiles with an altitude resolution of 10 m. GRA

N77-30695# Stanford Research Inst., Menlo Park, Calif.
OZONE IN THE NORTHEASTERN UNITED STATES Final Report
F. L. Ludwig and E. Shelar Mar. 1977 295 p refs
(Contract EPA-68-02-2352; SRI Proj. 4967)
(PB-267563/5; EPA-901/9-76-007) Avail: NTIS HC A13/MF A01 CSCL 04A

Data from the summer of 1975 northeast oxidant study have been combined with routinely collected weather and pollutant data to demonstrate that oxidant and its precursors are transported for distances in excess of 100 km in the New York, New Jersey, and southern New England regions. Vertical cross sections of ozone concentration clearly show urban ozone plumes. GRA

N77-30287*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
EXPERIMENTS ON ATMOSPHERIC PROCESSES
William W. Vaughan *In its* Proc. of the ASPE/MSFC Symp. on Eng. and Productivity Gains from Space Technol. May 1977 p 183-193 refs (For primary document see N77-30273 21-31)
Avail: NTIS HC A13/MF A01 CSCL 04A

47 METEOROLOGY AND CLIMATOLOGY

Includes weather forecasting and modification.

N77-30696 Pennsylvania State Univ., University Park.
THE EFFECT OF CLEAR AIR TURBULENCE ON ATMOSPHERIC MIXING Ph.D. Thesis
Werner J. Heck 1976 108 p
Avail: Univ. Microfilms Order No. 77-9677

The contribution of small scale motions to the total vertical mixing in the lower stratosphere was determined from wind and temperature fluctuation statistics. Efficiency was estimated from the vertical heat flux, which was computed from the co-spectra of the vertical velocity and temperature. A parameterization scheme for clear air turbulence in the stratosphere and troposphere was also developed. Dissert. Abstr.

N77-30697 Pennsylvania State Univ., University Park.
INITIALIZATION OF MODELS FOR NUMERICAL WEATHER PREDICTION BY A DYNAMIC-INITIALIZATION TECHNIQUE Ph.D. Thesis
James Edward Hoke 1976 222 p
Avail: Univ. Microfilms Order No. 77-9680

The application of dynamic initialization by nudging to numerical weather prediction was investigated with a series of increasingly realistic models of atmospheric flow. Theoretical and numerical results demonstrated that this technique, even with observed data, can under certain conditions be applied successfully to these models. In the nudging technique, the model state is forced toward the observed state by the addition of artificial terms to the predictive equations. The physical processes in the model spread the influence of the observations throughout the domain and permit the attainment of initial conditions dynamically balanced with respect to the model equations. Other advantages of the method are the generality of its application and the high degree of control over the insertion of the data. Dissert. Abstr.

N77-30698 Pennsylvania State Univ., University Park.
PREDICTION OF CONVECTIVE ACTIVITY USING A SYSTEM OF PARASITIC NESTED NUMERICAL MODELS Ph.D. Thesis
Donald J. Perkey 1976 195 p
Avail: Univ. Microfilms Order No. 77-9586

A limited area, three dimensional, moist, primitive equation model was developed to test the sensitivity of quantitative precipitation forecasts to the initial relative humidity distribution. Special emphasis was placed on the squall line region. Time dependent lateral boundaries and a general convective parameterization scheme suitable for midlatitude systems were developed. Dissert. Abstr.

N77-30699 Wyoming Univ., Laramie.
AN EVALUATION OF POLARIZATION DIVERSITY LIDAR FOR CLOUD PHYSICS RESEARCH Ph.D. Thesis
Kenneth Sassen 1976 414 p
Avail: Univ. Microfilms Order No. 77-11276

The results are described of an evaluation of the potential use of the monostatic lidar polarization technique for cloud physics research. With this technique, a pulse of linearly polarized laser energy is transmitted, and the energy scattered into a narrow cone about the backward direction is divided into the planes of polarization parallel and orthogonal to that of the source by the receiver and recorded as a function of range. Necessitated by the absence of theoretical treatments of optical backscattering by non-spherical hydrometeors, the information content of atmospheric lidar returns has been assessed experimentally. A significant potential has been demonstrated for contributions by polarization diversity lidar to cloud physics research. As examples, the lidar field studies have provided information concerning the dependence of relative ice-water content on orographic cloud base temperature, the temporal variability in the structure and behavior of complex cloud systems, and the graupel and snowflake precipitation generation mechanisms responsible for rainfall from high plains thunderstorms. Dissert. Abstr.

N77-30700 Pennsylvania State Univ., University Park.
NESTED GRIDS IN NUMERICAL WEATHER PREDICTION AND AN APPLICATION TO A MESOSCALE JET STREAK Ph.D. Thesis
Joseph Peter Sobel 1976 145 p
Avail: Univ. Microfilms Order No. 77-9737

The technique used modified finite difference forms to compute the tendencies at the interface of the coarse mesh (CMG) and the fine mesh (FMG) and thus allowed mutual interactions between the two grids. In addition, the technique has the advantageous property of conserving fluxes across the internal interface. The equations were integrated on a horizontally staggered grid by the box method. Special finite difference forms were required along each edge of the internal interface and at the four corners. A two-dimensional barotropic model was used to compare the mutually-interacting nesting technique to a one-way interacting approach in which the boundary points of the FMG were specified from an independent forecast of the CMG. For Haurwitz waves of various sizes, little difference was found between the techniques when a single-scale disturbance was present. Dissert. Abstr.

N77-30701 Wisconsin Univ., Madison.
TROPICAL OBSERVATIONS OF MIXED LAYER CHANGES CAUSED BY CUMULUS DOWNDRAFTS TAKEN IN THE GATE PROBLEM Ph.D. Thesis
Donald P. Wylie 1976 93 p
Avail: Univ. Microfilms Order No. 77-6637

Extreme changes in mixed layer turbulence and structure were observed over the tropical ocean when downdrafts from precipitating cumulus clouds penetrated to the surface. The fluxes of heat and moisture from the ocean were increased by the lowered temperatures and increased wind speeds produced by the downdrafts. These fluxes helped to rebuild the mixed layer back to its original energy state that existed before the precipitation. Satellite and radar observations showed that these downdraft circulations were caused by deep precipitating cumulus clouds. The mass flux in one of these downdraft systems was found to be comparable to the mass flux of the updraft reaching the cirrus anvil. Dissert. Abstr.

N77-30702 Ohio State Univ., Columbus.
ELECTROMAGNETIC SCATTERING FROM NON-SPHERICAL HYDROMETEORS WITH APPLICATIONS IN RADAR METEOROLOGY Ph.D. Thesis
Viswanathan Naganathan Bringi 1976 99 p
Avail: Univ. Microfilms Order No. 77-10496

Electromagnetic scattering from perfect conductors or dielectrics imbedded in a dielectric body is analyzed using an extended integral equation method. This technique provides a

matrix solution to the scattering problem. Scattering properties of the body are characterized by the transition or T-matrix which involves solutions of the vector Helmholtz equation in terms of spherical vector wave functions. Computer programs were developed to solve for the T-matrix of axisymmetric imbedded perfect conductors and dielectrics, the far zone fields and scattering cross sections. Solutions for the back scattering cross sections of concentric, spherical scatterers using the T-matrix method were found to be in excellent agreement with extended Mie theory solutions. Dissert. Abstr.

N77-30703# National Weather Service, Sterling, Va. Observation Techniques Development and Test Branch.
SURVEY OF ANEMOMETERS Final Report
Richard J. Stone and James T. Bradley Mar. 1977 47 p refs (Contract FAA-ER-450-029)
(AD-A040649; FAA-RD-77-49) Avail: NTIS HC A03/MF A01 CSCL 04/2

A search of the pertinent literature for the past ten years was conducted. Over 30 manufacturers of wind sensing equipment were contacted, and discussions were held with research groups who have used the new generation equipment in field studies. It was found that most of the advances have resulted in lower starting speeds and greater instrument bandwidth, since much of the recent meteorological effort has been directed toward micro-meteorological (turbulence) measurements. While the ruggedness, reliability, and range necessary for aviation use have not been primary considerations of manufacturers, there are several commercially available wind systems which could replace the F420C on a cost effective basis. It is recommended that: (1) for the near future, any one of several suitable cup and vane or propeller on a vane wind systems be used for aviation purposes; (2) the vortex wind sensor mounted on a vane be thoroughly field tested; and (3) that the nonmoving part vortex vector anemometer and hot-film anemometer undergo testing and their continued development be monitored. Author (GRA)

N77-30704*# National Aeronautics and Space Administration. Goddard Inst. for Space Studies, New York.
A FOURIER APPROACH TO CLOUD MOTION ESTIMATION
Albert Arking, Robert C. Lo (Maryland Univ., College Park), and Azriel Rosenfield (Maryland Univ., College Park) Jun. 1977 32 p refs Submitted for publication
(Grant NGR-21-002-378)
(NASA-TM-X-71368; X-911-77-167) Avail: NTIS HC A03/MF A01 CSCL 04B

A Fourier technique is described for estimating cloud motion from pairs of pictures using the phase of the cross spectral density. The method allows motion estimates to be made for individual spatial frequencies, which are related to cloud pattern dimensions. Results obtained are presented and compared with the results of a Fourier domain cross correlation scheme. Using both artificial and real cloud data show that the technique is relatively sensitive to the presence of mixtures of motions, changes in cloud shape, and edge effects. Author

N77-30705*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
FRONTS AND FRONTOGENESIS AS REVEALED BY HIGH TIME RESOLUTION DATA
Albert E. Frank (Oregon State Univ.) and David A. Barber (Oregon State Univ.) Aug. 1977 135 p refs
(NASA-RP-1005; M-226) Avail: NTIS HC A07/MF A01 CSCL 04B

Upper air sounding are used to examine a cold front of average intensity. Vertical cross sections of potential temperature and wind, and horizontal analyses were compared and adjusted for consistency. These analyses were then used to study the evolution of the front, found to consist of a complex system of fronts occurring at all levels of the troposphere. Low level fronts were strongest at the surface and rapidly weakened with height. Fronts in the midddle troposphere were much more intense. The warm air ahead of the fronts was nearly barotropic, while the cold air behind was baroclinic through deep layers. A deep mixed layer was observed to grow in this cold air. Author

N77-30706# Air Force Geophysics Lab., Hanscom AFB, Mass. Meteorology Div.
METEOROLOGICAL SATELLITE MEASUREMENTS AND APPLICATIONS
James T. Bunting, Francis R. Valovcin, and Thomas J. Keegan 3 Feb. 1977 17 p refs
(AF Proj. 8628)
(AD-A040703; AFGL-TR-77-0035; AFGL-AFSG-362) Avail: NTIS HC A02/MF A01 CSCL 22/2

Several current programs in satellite meteorology at the Air Force Geophysics Laboratory are reviewed. First of all, the use of reflected sunlight at both visible and near infrared frequencies to distinguish snow from clouds is described. Secondly, a technique of compositing pictures of many typhoon cases in order to relate cloud features to typhoon motion is discussed. Finally, the use of visible and infrared imagery to estimate erosion parameters for reentry systems is described. Author (GRA)

48 OCEANOGRAPHY

Includes biological, dynamic and physical oceanography; and marine resources.

N77-30707*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
COASTAL WAVE MEASUREMENTS DURING PASSAGE OF TROPICAL STORM AMY
W. Douglas Morris Apr. 1977 38 p
(NASA-TM-74060) Avail: NTIS HC A03/MF A01 CSCL 08C

Aerial photographic and laser profilometer data of waves generated by tropical storm Amy are presented. The data mission consisted primarily of two legs, one in the direction of the wind waves, and the second along the direction of swell propagation, using Jennette's Pier at Nags Head, North Carolina, as a focal point. At flight time, Amy's center was 512 nmi from shore and had maximum winds of 60 knots. The storm's history is presented, along with a satellite photograph, showing the extent of the storm on the day of the flight. Flight ground tracks are presented along with sample aerial photographs of the wave conditions showing approximate wavelength and direction. Sample wave energy spectra are presented both from the laser profilometer onboard the aircraft, and from the Corps of Engineers Research Center (CERC) shore gauge at Nags Head, North Carolina.
Author

N77-30708# Woods Hole Oceanographic Institution, Mass.
MARINE RESOURCES DEVELOPMENT AND MANAGEMENT: A REPORT ON THE WOODS HOLE OCEANOGRAPHIC INSTITUTION SEA GRANT PROGRAM, JULY 1975 - JUNE 1976 Annual Technical Report
Dean F. Bumpus Dec. 1976 50 p refs
(Grant NOAA-04-6-158-44016)
(PB-267531/2; WHOI-76-111; NOAA-77041807) Avail: NTIS HC A03/MF A01 CSCL 08A

The Woods Hole Oceanographic Institution is conducting research in all phases of marine science programs which includes research in aquiculture, political studies, ocean engineering, living resources, marine economics, ocean law-coastal, and marine environmental research and the development of one course in coastal zone management at the Massachusetts Maritime Academy. GRA

51 LIFE SCIENCES (GENERAL)

Includes genetics.

N77-30709*# Kentucky Univ., Lexington. Wenner Gren Research Lab.
EFFECTS OF BACKGROUND GRAVITY STIMULI ON GRAVITY-CONTROLLED BEHAVIOR Final Report, 1 Sep. 1972 - 1 Jan. 1976
D. F. McCoy 1 Jan. 1976 18 p refs
(Grant NGR-18-001-068)

(NASA-CR-153404) Avail: NTIS HC A02/MF A01 CSCL 06C

Physiological and developmental effects of altered gravity were researched. The stimulus properties of gravity have been found to possess reinforcing and aversive properties. Experimental approaches taken, used animals placed into fields of artificial gravity, in the form of parabolic or spiral centrifuges. Gravity preferences were noted and it was concluded that the psychophysics of gravity and background factors which support these behaviors should be further explored. Author

N77-30710*# National Aeronautics and Space Administration. Goddard Inst. for Space Studies, New York.
APPLICATION OF FIREFLY LUCIFERASE ASSAY FOR ADENOSINE TRIPHOSPHATE (ATP) TO ANTIMICROBIAL DRUG SENSITIVITY TESTING
G. L. Picciolo, S. Tuttle, C. G. Schrock, J. W. Deming, M. Barza, L. Wienstein, and E. W. Chappelle Washington Jul. 1977 161 p refs
(NASA-TN-D-8439; G-7703) Avail: NTIS HC A08/MF A01 CSCL 06C

The development of a rapid method for determining microbial susceptibilities to antibiotics using the firefly luciferase assay for adenosine triphosphate (ATP) is documented. The reduction of bacterial ATP by an antimicrobial agent was determined to be a valid measure of drug effect in most cases. The effect of 12 antibiotics on 8 different bacterial species gave a 94 percent correlation with the standard Kirby-Buer-Agar disc diffusion method. A 93 percent correlation was obtained when the ATP assay method was applied directly to 50 urine specimens from patients with urinary tract infections. Urine samples were centrifuged first to that bacterial pellets could be suspended in broth. No primary isolation or subculturing was required. Mixed cultures in which one species was predominant gave accurate results for the most abundant organism. Since the method is based on an increase in bacterial ATP with time, the presence of leukocytes did not interfere with the interpretation of results. Both the incubation procedure and the ATP assays are compatible with automation. Author

52 AEROSPACE MEDICINE

Includes physiological factors, biological effects of radiation; and weightlessness.

N77-30711 Texas Univ. Health Science Center, Houston.
THE APPLICATION OF PATH ANALYSIS TO THE STUDY OF INTERRELATIONS AMONG COMPONENTS OF THE OXYGEN TRANSPORT SYSTEM IN MAN Ph.D. Thesis
Robert Francis Weisberg 1976 331 p
Avail: Univ. Microfilms Order No. 77-9282

Path coefficient analysis of the oxygen transport system in man was done in order to study the relationship of the variance of a biological system compared to the sum of the variances of its components. The transport system was delineated as a compartmental system, and its physiology was summarized under various conditions including health, hypoxia, training and adaptation to disease. Results show that in a properly functioning system, the sum of the variances of the components of the system, far exceeds the variance of the system itself. Dissert. Abstr.

N77-30712 Pennsylvania Univ., Philadelphia.
INERT GAS TRANSFER IN THE BODY: EXPERIMENTAL STUDY AND PERFUSION/DIFFUSION MODELING OF TRANSCUTANEOUS AND GAS CAVITY EXCHANGE RATES Ph.D. Thesis
Jerry Michael Collins 1976 236 p
Avail: Univ. Microfilms Order No. 77-10149

Flux rates for inert gases were measured in anesthetized pigs. The skin, subcutaneous tissue, and peritoneal cavity were investigated. Inert gas transcutaneous efflux rates were studied as a function of skin temperature on the lower abdominal region. Helium flux seemed to be perfusion limited, suggesting its use as an indicator of skin blood flow rate. Flux rates increased with increasing skin temperature. Dissert. Abstr.

N77-30713 Wayne State Univ., Detroit, Mich.
THE RESPONSE OF SPINE MUSCULATURE DURING +G SUB z ACCELERATION Ph.D. Thesis
Stephen Albert Tennyson 1976 197 p
Avail: Univ. Microfilms Order No. 77-9459

Noise free electromyographic signals were acquired during whole body G(z) acceleration, using canine subjects. Pairs of shielded monopolar needle electrodes were sutured into the semispinalis, erector spinae and multifidus muscles of canines. The dogs were then constrained to sit upright in the seat of vertical accelerator and subjected to +G(z) acceleration in the range of 2 to 5g. Recorded runs yielded evidence of muscle activity in all muscle groups monitored. Dissert. Abstr.

N77-30714*# Kanner (Leo) Associates, Redwood City, Calif.
EVALUATION OF STRESS ON A PILOT DURING AGRICULTURAL FLIGHTS BASED ON PHYSIOLOGICAL STUDIES
L. Markiewicz, D. Koradecka, and M. Konarska Washington NASA Jul. 1977 12 p Transl. into ENGLISH from Tech. Lotnicza i Astronaut. (Poland), v. 31, no. 1, 1976 p 13-16 Transl. was announced as A76-20616
(NASA-TT-F-17445) Avail: NTIS HC A02/MF A01 CSCL 06E

An ergonomic analysis of the development of fatigue in a pilot during agricultural work is presented. Selected indicators of physiological activity during flights on PZL-101 Gawron and An-2 airplanes and Mi-2 and SM-2 helicopters are studied under various flight conditions. Author

N77-30715*# National Aeronautics and Space Administration, Washington, D. C.
PROCEEDINGS OF THE ANNUAL CONFERENCE OF NASA CLINIC DIRECTORS, ENVIRONMENTAL HEALTH OFFICIALS, AND MEDICAL PROGRAM ADVISORS
1975 292 p refs Conf. held at Williamsburg, Va., 18-20 Mar. 1975
(NASA-TM-74848) Avail: NTIS HC A13/MF A01 CSCL 06E

Occupational Medicine and Environmental Health Programs are discussed. Throughout the conference, the employer's responsibility to provide a reasonably safe work environment, is emphasized. For individual titles, see N77-30716 through N77-30734.

N77-30716*# National Aeronautics and Space Administration, Washington, D. C.
NASA OCCUPATIONAL MEDICINE PROGRAMS: OUR OBLIGATION TO MANAGEMENT
Louis B. Arnoldt and Jean Mockbee *In its* Proc. of the Ann. Conf. of NASA Clinic Directors, Environ. Health Offic., and Med. Program Advisors 1975 p 1-42 (For primary document see N77-30715 21-52)
Avail: NTIS HC A13/MF A01 CSCL 06E

Factors to be considered in forming policies for managing NASA's health maintenance program to provide optimum arrangement for quality medical care are discussed. Topics include scheduling routine physical examinations, job related stress, prevalence of chronic diseases, additions to the PROM data system, and disease trends among personnel. A.R.H.

N77-30717*# National Aeronautics and Space Administration, Washington, D. C.
ENVIRONMENTAL HEALTH TRENDS
Gene Proctor *In its* Proc. of the Ann. Conf. of NASA Clinic Directors, Environ. Health Offic., and Med. Program Advisors 1975 p 43-60 (For primary document see N77-30715 21-52)
Avail: NTIS HC A13/MF A01 CSCL 06E

Trends in environmental health listed include: specific health concerns, sources of organic dusts causing pneumonitis, toxic substances lists, criteria documents, and regulatory developments. Author

N77-30718*# Occupational Safety and Health Administration, Washington, D. C. Office of Standards.
CURRENT ASPECTS OF OCCUPATIONAL CHEMICAL CARCINOGENESIS
Donald Lassiter *In* NASA, Washington Proc. of the Ann. Conf. of NASA Clinic Directors, Environ. Health Offic., and Med. Program Advisors 1975 p 61-74 (For primary document see N77-30715 21-52)

Avail: NTIS HC A13/MF A01 CSCL 06E

The history of measures to control occupational exposure to carcinogenic substances is reviewed. Health hazards associated with exposure to a certain chemical substance must be considered not only from the aspects of its acute or chronic toxicity, but also from its potential to produce tumors (latent effect). There can be no clear distinction between classic toxicity and oncogenesis until the mechanisms of both are completely understood for a given chemical substance. The assessment of carcinogenic potential for a specific substance must include the consideration of published information, monitoring and control data from the affected industry, and the in-depth epidemiologic experience of affected employees. A.R.H.

N77-30719*# Edgewood Arsenal, Aberdeen Proving Ground, Md.

CONCEPTS IN HEALTH EVALUATION OF COMMERCIAL AND INDUSTRIAL CHEMICALS

Bernard P. McNamara *In* NASA, Washington Proc. of the Ann. Conf. of NASA Clinic Directors, Environ. Health Offic., and Med. Program Advisors 1975 p 75-108 refs (For primary document see N77-30715 21-52)

Avail: NTIS HC A13/MF A01 CSCL 06E

A method is described for determining no toxic effect exposure levels based on short-term testing of industrial and commercial chemicals. Procedures for monitoring all organs and body functions for the presence or absence of toxicological effects are demonstrated using various laboratory animals. A.R.H.

N77-30720*# Kettering Memorial Hospital, Dayton, Ohio. Cardiac Diagnostic Laboratory.

EXERCISE STRESS TESTING

Benjamin Schuster *In* NASA, Washington Proc. of the Ann. Conf. of NASA Clinic Directors, Environ. Health Offic., and Med. Program Advisors 1975 p 109-118 (For primary document see N77-30715 21-52)

Avail: NTIS HC A13/MF A01 CSCL 06E

Positive maximum stress tests in the management of coronary patients are discussed. It is believed that coronary angiography would be the ultimate test to predict the future of patients with coronary heart disease. Progression of angina, myocardial infarction, and death due to heart disease were analyzed. I.M.

N77-30721*# National Aeronautics and Space Administration. Wallops Station, Wallops Island, Va.

REVIEW OF HEALTH MAINTENANCE PROGRAM FINDINGS, 1960-1974

Edward S. White *In its* Proc. of the Ann. Conf. of NASA Clinic Directors, Environ. Health Offic., and Med. Program Advisors 1975 p 119-138 (For primary document see N77-30715 21-52)

Avail: NTIS HC A13/MF A01 CSCL 06E

A preliminary analysis of the employee's examination records of the automated medical data base at the NASA Wallops Flight Center, Va., with an emphasis on the primary mission of the program-the early detection and control of cardiovascular disease, is presented. I.M.

N77-30722*# Catholic Univ. of America, Washington, D. C. Dept. of Psychology and Psychiatry.

BEHAVIOR PATTERNS AND CORONARY HEART DISEASE

John C. Townsend and Jeremiah P. Cronin *In* NASA, Washington Proc. of the Ann. Conf. of NASA Clinic Directors, Environ. Health Offic., and Med. Program Advisors 1975 p 139-148 (For primary document see N77-30715 21-52)

Avail: NTIS HC A13/MF A01 CSCL 06E

The relationships between two behavioral patterns, cardiac risk factors, and coronary heart disease are investigated. Risk factors used in the analysis were family history of coronary disease, smoking, cholestorol, obesity, systotic blood pressure, diastolic blood pressure, blood sugar, uric acid, erythrocyte sedimentation rate, and white blood unit. It was found that conventional, non-behvioral pattern risk factors alone were not significantly related to coronary heart disease. I.M.

N77-30723*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.

JPL NOISE CONTROL PROGRAM

A. F. Klascius *In* NASA, Washington Proc. of the Ann. Conf. of NASA Clinic Directors, Environ. Health Offic., and Med. Program Advisors 1975 p 149-158 (For primary document see N77-30715 21-52)

(Contract NAS7-100)

Avail: NTIS HC A13/MF A01 CSCL 06E

Exposures of personnel to noise pollution at the Jet Propulsion Laboratories, Pasadena, California, were investigated. As a result of the study several protective measures were taken: (1) employees exposed to noise hazards were required to wear ear-protection devices, (2) mufflers and air diversion devices were installed around the wind tunnels; and (3) all personnel that are required to wear ear protection are given annual audimeter tests. I.M.

N77-30724*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

ENVIRONMENTAL HEALTH CONCERNS IN NATURAL AND MAN-MADE ENVIRONMENTS

Charles P. Bergtholdt *In its* Proc. of the Ann. Conf. of NASA Clinic Directors, Environ. Health Offic., and Med. Program Advisors (For primary document see N77-30715 21-52)

Avail: NTIS HC A02/MF A01 CSCL 06E

Industrial hygene and environmental health aspects of ground operation at the Jet Propulsion Laboratory were investigated. Major areas of concern are: (1) toxic substances, (2) noise pollution, (3) electromagnetic radiation; and (4) biohazards and sanitation. Each of these categories are also studied in a closed environment, such as encountered aboard of a spacecraft. I.M.

N77-30725*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

THE US ENVIRONMENTAL PROTECTION AGENCY NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES)

Julian Manly Earls *In its* Proc. of the Ann. Conf. of NASA Clinic Directors, Environ. Health Offic., and Med. Program Advisors 1975 p 167-176 refs (For primary document see N77-30715 21-52)

Avail: NTIS HC A13/MF A01 CSCL 06E

An evaluation of the Lewis Research Center's storm, sanitary and industrial sewer systems, in compliance with the Federal Water Pollution Control Act, is presented. The investigation of a proposed sampling and flow measurement system includes cost estimates to meet the Federal and State of Ohio requirements. I.M.

N77-30726*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

NASA LANGLEY PHYSICAL EXAMINATION PROGRAM

Robert L. McArthur *In its* Proc. of the Ann. Conf. of NASA Clinic Directors, Environ. Health Offic., and Med. Program Advisors 1975 p 177-188 (For primary document see N77-30715 21-52)

Avail: NTIS HC A02/MF A01 CSCL 06E

A comprehensive survey was made of the NASA Headquarters in the Washington, D. C. area, and medical facilities capable to provide satisfactory and economical services to employees within a reasonable traveling range. The program to improve medical services is described. I.M.

N77-30727*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

ANNUAL HEALTH EXAMINATION PROGRAM, AMES RESEARCH CENTER

Lewis Hughes and Joseph LaDou *In its* Proc. of the Ann. Conf. of NASA Clinic Directors, Environ. Health Offic., and Med. Program Advisors 1975 p 189-224 (For primary document see N77-30715 21-52)

(Contract NAS76-28)

Avail: NTIS HC A13/MF A01 CSCL 06E

A cost analysis of a low-volume multiphasic health testing program is presented. The results indicate that unit costs are similar to those of high-volume automated programs. The comparability in unit cost appears to result from the savings in personnel and space requirements of the smaller program as compared with the larger ones. I.M.

N77-30728*# Massachusetts Inst. of Tech., Cambridge.

EVALUATION OF CLASS 2 BIOLOGICAL CABINETS

Richard E. Chamberlin *In* NASA, Washington Proc. of the Ann. Conf. of NASA Clinic Directors, Environ. Health Offic., and Med. Program Advisors 1975 P 225-236 (For primary document see N77-30715 21-52)
Avail: NTIS HC A13/MF A01 CSCL 06E

Basic investigations, consisting primarily of airflow measurements and visual smoke tests, were made on four commercially available units. The results indicated that performance varied considerably between units. Therefore, it was decided to outline the performance desired and to include in the overall equipment specifications a set of performance tests to assure a clean air safety cabinet with respect to chemical usage. The evaluation was to be based on aerodynamic performance under the various modes of operation. I.M.

N77-30729*# Civil Service Commission, Washington, D.C.
DISABILITY RETIREMENT
Raymond L. Eck *In* NASA Washington Proc. of the Ann. Conf. of NASA Clinic Directors, Environ. Health Offic., and Med. Program Advisors 1975 p 237-254 (For primary document see N77-30715 21-52)
Avail: NTIS HC A13/MF A01 CSCL 06E

Eligibility for disability retirement is discussed. General guidelines and a few standards are given. Usually the same basic medical principles apply to the evaluation of claims for disability retirement as apply to determining medical suitability for initial employment. I.M.

N77-30730*# Civil Service Commission, Washington, D.C.
MEDICAL SUITABILITY FOR FEDERAL EMPLOYMENT
Raymond L. Eck *In* NASA, Washington Proc. of the Ann. Conf. of NASA Clinic Directors, Environ. Health Offic., and Med. Program Advisors 1975 p 255-266 (For primary document see N77-30715 21-52)
Avail: NTIS HC A02/MF A01 CSCL 06E

The medical requirements of the Civil Service Commission in determining employability of applicants for Federal employment are presented. I.M.

N77-30731*# Air Force Radiological Health Lab., Wright-Patterson AFB, Ohio.
A REVIEW OF CURRENT AND PROPOSED STANDARDS FOR OCCUPATIONAL EXPOSURES TO RADIO-FREQUENCY ENERGY
L. T. Odland *In* NASA, Washington Proc. of the Ann. Conf. of NASA Clinic Directors, Environ. Health Offic., and Med. Program Advisors 1975 p 267-278 (For primary document see N77-30715 21-52)
Avail: NTIS HC A13/MF A01 CSCL 06E

The essential aspects of an acceptable r-f occupational exposure program are presented. They include exposure limits, surveillance of work environment, medical attention, investigation of accidental overexposures, and documentation of overexposures. Each aspect is briefly discussed. I.M.

N77-30732*# Air Force Radiological Health Lab., Wright-Patterson AFB, Ohio. Radiation Measurements Div.
RADIATION MEASURING INSTRUMENTATION
Harley V. Piltingsrud *In* NASA, Washington Proc. of the Ann. Conf. NASA Clinic Directors, Environ. Health Offic., and Med. Program Advisors 1975 p 279-292 (For primary document see N77-30715 21-52)
Avail: NTIS HC A13/MF A01 CSCL 06E

Four radiation measuring instruments were developed. These are: (1) improved detector probe, (2) neutron spectrometer--dosimeter, (3) portable ultraviolet spectro-radiometer; and (4) pocket ionization chamber radiation dosimeter. A brief description of each of these devices is presented. I.M.

N77-30733*# National Aeronautics and Space Administration, Washington, D. C.
DEVELOPMENT AND APPLICATION OF FUNCTIONAL MANNING STANDARDS IN THE NATIONAL AERONAUTICS AND SPACE AND SPACE ADMINISTRATION
Walter A. Maull *In its* Proc. of the Ann. Conf. of NASA Clinic Directors, Environ. Health Offic., and Med. Program Advisors 1975 p 293-298 (For primary document see N77-30715 21-52)
Avail: NTIS HC A13/MF A01 CSCL 06E

Regression analysis was applied to obtain a mathematical equation to determine a workload indicator in relation with the manpower required at the NASA. The equation thus derived was used to construct the requirements tables in the manning standards to improved management methods. Manning standards were discussed at a national conference. I.M.

N77-30734*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
HYPERTENSION SCREENING
John M. Foulke *In its* Proc. of the Ann. Conf. of NASA Clinic Directors, Environ. Health Offic., and Med. Program Advisors 1975 p 299-311 (For primary document see N77-30715 21-52)
Avail: NTIS HC A13/MF A01 CSCL 06E

An attempt was made to measure the response to an announcement of hypertension screening at the Goddard Space Center, to compare the results to those of previous statistics. Education and patient awareness of the problem were stressed. I.M.

N77-30735*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
THE APOLLO-SOYUZ TEST PROJECT: MEDICAL REPORT
Arnauld E. Nicogossian, comp. Washington 1977 129 p refs Original contains color illustrations
(NASA-SP-411) Avail: NTIS HC A07/MF A01 CSCL 06E

The results of the clinical aspects as well as the preflight and postflight research studies that were performed on the astronauts are presented. Because of the compromised postflight crew health status, not all postflight research procedures could be accomplished. This compromise was the result of the anomalous entrance of toxic gas into the spacecraft cabin during the earth landing sequence. Despite the exposure, the medical data collected are of sufficient interest to warrant inclusion in this official ASTP Medical Report. Author

N77-30736*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
INTRA-OCULAR PRESSURE NORMALIZATION APPARATUS Patent Application
Edward F. Baehr, inventor (to NASA) Filed 31 Aug. 1977 10 p
(NASA-Case-LEW-12955-1; US-Patent-Appl-SN-829318) Avail: NTIS HC A02/MF A01 CSCL 06B

A method and apparatus is described for safely reducing abnormally high intra-ocular pressure in an eye during a predetermined time interval. This allows maintenance of normal intraocular pressure during glaucoma surgery. A pressure regulator of the spring-biassed diaphragm type is provided with additional bias by a column of liquid. The height of the column of liquid is selected such that the pressure at a hypodermic needle connected to the output of the pressure regulator is equal to the measured pressure of the eye. The hypodermic needle can then be safely inserted into the anterior chamber of the eye. Liquid is then bled out of the column to reduce the bias on the diaphragm of the pressure regulator and, consequently, the output pressure of the regulator. This lowering pressure of the regulator also occurs in the eye by means of a small bleed path provided between the pressure regulator and the hypodermic needle. NASA

N77-30737*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
INTRA-OCULAR PRESSURE NORMALIZATION TECHNIQUE AND EQUIPMENT Patent Application
William J. McGannon, inventor (to NASA) Filed 31 Aug. 1977 10 p Sponsored by NASA
(NASA-Case-LEW-12723-1; US-Patent-Appl-SN-829317) Avail: NTIS HC A02/MF A01 CSCL 06B

A method and apparatus is described for safely reducing abnormally high intraocular pressure in an eye during a predetermined time interval. This allows maintenance of normal intraocular pressure during glaucoma surgery. A pressure regulator of the spring-biassed diaphragm type is provided with additional bias by a column of liquid. The height of the column of liquid is selected such that the pressure at a hypodermic needle connected to the output of the pressure regulator is equal to the measured pressured of the eye. The hypodermic needle can then by safely

inserted into the anterior chamber of the eye. Liquid is then bled out of the column to reduce the bias on the diaphragm of the pressure regulator and, consequently, the output pressure of the regulator. This lowering pressure of the regulator also occurs in the eye by means of a small second bleed path provided between the pressure regulator and the hypodermic needle.
NASA

N77-30738# Army Aeromedical Research Lab., Fort Rucker, Ala.
MEDICAL ASPECTS OF ARMY AVIATION AND AIRBORNE AND GROUND OPERATIONS AFFECTING HEALTH AND EFFICIENCY OF THE SOLDIERS Annual Progress Report, 1 Jul. 1975 - 30 Sep. 1976
Robert W. Bailey Oct. 1976 179 p refs
(DA Proj. 3A7-62758-A-819)
(AD-A039804) Avail: NTIS HC A09/MF A01 CSCL 06/5

It is the mission of this laboratory to conduct fundamental and applied research on the medical aspects of Army aviation, airborne and ground operations that affect the health, welfare and efficiency of the soldier; to perform medical research on visual/auditory functions; man/machine integration; the medical aspects of nonmedical materiel; physiological/psychological response to the operational environments; and military operational training impacts upon ecology. The laboratory provides technical advisory and consultant services to all elements of Department of Defense and other government agencies in support of helicopter, combat crew and airborne medicine. Problems presently being considered range from long-term fundamental research in the areas of vision, hearing loss, communications, and crash protection to the more immediate problems of the environmental characteristics of particular aircraft. GRA

N77-30739# Army Missile Research and Development Command, Redstone Arsenal, Ala. Physical Sciences Directorate.
FUNDAMENTALS IN VISIBILITY
Herbert B. Holl Feb. 1977 56 p refs
(DA Proj. 1L1-61102-AH-49)
(AD-A040836; DRDMI-TR-77-1) Avail: NTIS HC A04/MF A01 CSCL 17/8

It is the purpose of this report to outline research results which define the fundamentals of visibility acuity. The report will deal with the following subjects: visual acuity of the human eye; determination minimum visibility; acuity and sensitivity; visibility of light sources; brightness and illumination of sky and terrain and changes from day to night; the color of skylight, and the variation of visibility during a day. GRA

N77-30740# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Bad Godesberg (West Germany). Inst. fuer Flugmedizin.
INFLUENCE OF THE JOURNEY'S TIME OF DAY ON THE DE- AND RESYNCHRONIZATION OF THE 24-HOUR RHYTHM OF BODY TEMPERATURE AFTER TRANSATLANTIC FLIGHTS Ph.D. Thesis - Bonn Univ.
Arnold Theodor Sonderfeld 24 Mar. 1977 48 p refs In GERMAN; ENGLISH summary Report will also be announced as translation (ESA-TT-420)
(DLR-FB-77-10) Avail: NTIS HC A03/MF A01; DFVLR, Cologne DM 22.80

The influence of a time-shift of 6 hours on the 24-hour rhythm of body temperature was investigated in a group of eight students in Germany and the U.S.A. by measuring their rectal-temperatures after transatlantic flights. The temperatures were taken continuously over the first six days and on days 8 and 13 after an east-west flight and after a west-east flight. In contrast to previous studies in which the west flight was day-flight, the east flight a night-flight, both flights in this case were day-flights. The time of resynchronization after the east-west flight ran up to seven days, the time after a flight in the opposite direction up to ten days. This result squares with the results gained from previous experiments on day and night flights in so far as an influence of the hour of the day, at which the flight is carried out, is not supposed. Author (ESA)

N77-30741# Naval Postgraduate School, Monterey, Calif.
STRESS DETECTION UTILIZING THE ELECTROENCEPHALOGRAM M.S. Thesis
Harold Jean Fricke, Jr. Mar. 1977 83 p refs
(AD-A039168) Avail: NTIS HC A05/MF A01 CSCL 06/2

A method of stress detection utilizing the electroencephalogram is presented. Limited discussion on nerve cells and some physiological aspects of stress are discussed. Considerable data is presented which supports a stress detection theory. Methods of stress inducement utilized and the conduct of an electroencephalogram are described. GRA

N77-30742# Naval Postgraduate School, Monterey, Calif.
COMPUTER MODELING THE NEUROPHYSIOLOGY OF VISION M.S. Thesis
Seaborn Montgomery McCrory, III Mar. 1977 125 p refs
(AD-A039321) Avail: NTIS HC A06/MF A01 CSCL 06/16

The pertinent points of visual neurophysiology and neuroanatomy are reviewed with particular emphasis on how retinal light distributions result in perceived phenomena. The neural modeling techniques used at the Naval Postgraduate School are described. These stem from a basic model capable of calculating the postsynaptic potential and spike outputs for any sequence of excitatory and inhibitory inputs. More advanced programs model facilitation, fatigue, and narrow band motion detection. The most advanced program models lateral inhibition in an eight neuron linear array. GRA

N77-30743# Pittsburgh Univ., Pa. Graduate School of Public Health.
TOXICITY OF PLASTIC COMBUSTION PRODUCTS. TOXICOLOGICAL METHODOLOGIES TO ASSESS THE RELATIVE HAZARDS OF THERMAL DECOMPOSITION PRODUCTS FROM POLYMERIC MATERIALS Ph.D. Thesis
Craig Stewart Barrow Feb. 1977 313 p refs
(Grant NBS-5-9005)
(PB-267233/5; NBS-GCR-77-85) Avail: NTIS HC A14/MF A01 CSCL 06T

Sensory and pulmonary irritation effects of thermal degradation products from natural and synthetic materials were studied using mice. Mice were used to develop a sensory irritation stress index based on changes in respiratory rate. In addition, acute lethality was obtained. Dose-response curves were generated for decomposition products from Douglas Fir, PVC, flexible polyurethane, teflon, and fiberglas reinforced polyester. Similar data were obtained for CO, CO2, low O2, acrolein, HCl and Cl2. Preliminary studies on the pulmonary effects of combustion products using rabbits are also reported. GRA

N77-30744# New England Medical Center Hospitals, Boston, Mass.
DEVELOPMENT OF A DIFFERENTIAL WHITE CELL COUNT SYSTEM: TERMINAL PROGRESS REPORT Progress Report, 1 Apr. 1971 - 31 Dec. 1976
Peter W. Neurath May 1977 13 p refs
(Grant PHS-HS-00696)
(PB-268364/7; NCHSR-77/167) Avail: NTIS HC A02/MF A01 CSCL 06L

A high resolution (spatial, intensity and color or wavelength resolution) scanning microscope was built to develop the next generation of pattern recognition algorithms and techniques. A high percentage of white cell counts have been unrealiable due to insufficient training and worker fatigue. An accurate, consistent, 500 cell differential made by a proven machine to which quality control procedures can be applied effectively will make this common test not only less expensive but far more reliable and diagnostically meaningful. GRA

N77-30745# Rochester Univ., N. Y. Dept. of Electrical Engineering.
TISSUE CHARACTERIZATION WITH ULTRASOUND Progress Report, 15 Jun. 1975 - 14 Jun. 1976
Robert C. Waag 1976 163 p refs
(Grant NSF APR-75-14890)
(PB-267397/8; NSF/RA-760407) Avail: NTIS HC A08/MF A01 CSCL 06L

Noninvasive tissue characterization is determined with ultrasound by adapting the concepts used in X-ray diffraction and atmospheric probing with radar. Hardware aquisition and assembly for the collection of ultrasound scattering and optical image data; software development for data acquisition, processing,

and display; mathematical analysis of factors influencing measurement of ultrasound scattering by tissue; and correlation studies of ultrasound and optical data are included. GRA

N77-30746# London Univ. (England). Dept. of Thoracic Medicine.
HISTOCOMPATIBILITY ANTIGENS AND THE EVOLUTION OF HYPERSENSITIVITY LUNG DISEASES. (AIM AND METHODOLOGY) Annual Report, Jul. 1976 - May 1977
M. Turner-Warwick May 1977 34 p refs
(Contract NO1-HR-6-2935)
(PB-267133/7; NIH-NO1-HR-62935-1A) Avail: NTIS HC A03/MF A01 CSCL 06E

The background to the investigation of histocompatibility antigens in diseases of the chest in which hypersensitivity may be important is discussed. The diseases to be studied are asthma, sarcoidosis, extrinsic allergic alveolitis and cryptogenis fibrosing alveolitis. The basic design of the study is an analysis of families, and of groups of patients defined by stringent clinical criteria, correlating with immunological markers where possible. The aims of the project are restated and the clinical and laboratory methods described. An account of the families and groups studied so far is given. GRA

53 BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

N77-30747*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
MODEL OF AIRCRAFT NOISE ADAPTATION
Thomas K. Dempsey, Glynn D. Coates (Old Dominion Univ.), and Jimmy M. Cawthorn Jul. 1977 63 p
(NASA-TM-74052) Avail: NTIS HC A04/MF A01 CSCL 05H

Development of an aircraft noise adaptation model, which would account for much of the variability in the responses of subjects participating in human response to noise experiments, was studied. A description of the model development is presented. The principal concept of the model, was the determination of an aircraft adaptation level which represents an annoyance calibration for each individual. Results showed a direct correlation between noise level of the stimuli and annoyance reactions. Attitude-personality variables were found to account for varying annoyance judgements. Author

N77-30748# Aston Univ., Birmingham (England).
HUMAN RELIABILITY IN COMPLEX SYSTEMS: AN OVERVIEW
D. E. Embrey Jul. 1976 85 p refs Sponsored by UKAEA
(NCSR-R-10) Avail: NTIS (US Sales only) HC A05/MF A01

The main conceptual background underlying the areas of human reliability and human error is analyzed. The concept of error is examined and generalized to that of human reliability, and some of the practical and methodological difficulties of reconciling the different standpoints of the human factors specialist and the engineer are explored. Following a survey of general reviews available on human reliability, quantitative techniques for prediction of human reliability are considered. An in-depth critical analysis of the various quantitative methods is presented, together with the data bank requirements for human reliability prediction. Reliability considerations in process control and nuclear plant, and also areas of design, maintenance, testing and emergency situations are discussed. The effects of stress on human reliability are analyzed and methods of mimimizing these effects discussed. ERA

54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

N77-30749* National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, Fla.
ROTATIONAL JOINT ASSEMBLY FOR THE PROSTHETIC LEG Patent
Lester J. Owens and William C. Jones, inventors (to NASA) Issued 2 Aug. 1977 5 p Filed 30 Jul. 1976 Supersedes N77-15618 (15 - 06, p 0786)
(NASA-Case-KSC-11004-1; US-Patent-4,038,705; US-Patent-Appl-SN-710032; US-Patent-Class-3-2; US-Patent-Class-3-21) Avail: US Patent Office CSCL 06D

A rotational joint assembly for a prosthetic leg has been devised, which enables an artificial foot to rotate slightly when a person is walking, running or turning. The prosthetic leg includes upper and lower tubular members with the rotational joint assembly interposed between them. The assembly includes a restrainer mechanism which consists of a pivotably mounted paddle element. This device applies limiting force to control the rotation of the foot and also restores torque to return the foot back to its initial position.
Official Gazette of the U.S. Patent Office

N77-30750*# Virginia Univ., Charlottesville. School of Engineering and Applied Science.
A TRADE-OFF ANALYSIS DESIGN TOOL. AIRCRAFT INTERIOR NOISE-MOTION/PASSENGER SATISFACTION MODEL Final Report
I. D. Jacobson Sep. 1977 213 p refs
(Grant NsG-1180)
(NASA-CR-154807; UVA/528120/ESS77/103) Avail: NTIS HC A10/MF A01 CSCL 05E

A design tool was developed to enhance aircraft passenger satisfaction. The effect of aircraft interior motion and noise on passenger comfort and satisfaction was modelled. Effects of individual aircraft noise sources were accounted for, and the impact of noise on passenger activities and noise levels to safeguard passenger hearing were investigated. The motion noise effect models provide a means for tradeoff analyses between noise and motion variables, and also provide a framework for optimizing noise reduction among noise sources. Data for the models were collected onboard commercial aircraft flights and specially scheduled tests. Author

N77-30751*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
AN IMPROVED CONTROLLER ARM FOR A REMOTELY RELATED SLAVE ARM Patent Application
J. Kenneth Salisbury, Jr., inventor (to NASA) (Stanford Univ., Calif.) Filed 19 Aug. 1977 26 p Sponsored by NASA
(NASA-Case-ARC-11052-1; US-Patent-Appl-SN-826202) Avail: NTIS HC A03/MF A01 CSCL 05H

A segmented controller arm, configured and dimensioned to form a miniature kinematic replica of a remotely related slave arm is outlined. The arm includes a plurality of joints for affording segments of the arm simultaneous angular displacement, a plurality of position sensing devices, and a control signal circuit for generating control signals. The arm is characterized by a plurality of yokes, supported for angular displacement about a pair of orthogonally related axes and counterbalanced against gravitation by a cantilevered mass. Thee controller arm may be released without introducing unwanted motion in the slave arm, resulting from gravitation of segments of the master arm. NASA

N77-30752# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
A VISUALLY-COUPLED AIRBORNE SYSTEMS SIMULATOR (VCASS): AN APPROACH TO VISUAL SIMULATION
Dean F. Kocian 1977 11 p Presented at the Image Conf., Phoenix, Ariz., 17-18 May 1977
(AD-A039999; AMRL-TR-77-31) Avail: NTIS HC A02/MF A01 CSCL 09/3

This paper describes a new approach to solving the visual presentation problems of aircraft simulators by using visually coupled systems (VCS). For many years it has been the mission of this laboratory to optimize the visual interface of crew members to advanced weapon systems. This mission has been primarily pursued in two areas: (1) the establishment of control/display engineering criteria; and (2) the prototyping of advanced concepts for control and display interface. An important part of fulfilling

this mission has been the development of VCS components which includes head position sensing systems or helmet mounted sights (HMS), eye position sensing systems (EPS) and helmet mounted displays (HMD). The author believes that the unique capabilities of a visually-coupled system (VCS combination of a helmet-mounted sight and helmet-mounted display) can meet the simulation requirements as well as improve upon existing ground based simulation techniques. GRA

N77-30753# Navy Clothing and Textile Research Unit, Natick, Mass.
ONE-SIZE SLUSH-MOLDED POLYVINYL CHLORIDE COVER FOR THE NAVY MALE SERVICE COMBINATION CAP FRAME Technical Report, Jul. 1975 - Apr. 1976
Albert J. Chaiken Mar. 1977 7 p
(AD-A039508; NCTRF-TR-125; Rept-11-76) Avail: NTIS HC A02/MF A01 CSCL 06/17

The Navy Clothing and Textile Research Facility NCTRF is service testing one-size, stretchable, slush-molded, white plastic covers for the standard Navy service combination cap for men, to ascertain user acceptability of design, material and sizing. Initial response by test participants has revealed that the molded item appears to have merit as a suitable replacement for the standard 13 sizes of cotton cap covers currently worn by Naval Personnel. However, it appears that two sizes of this molded cover will be required, because subjects with small head sizes found the item too large. Author (GRA)

N77-30754# Army Aeromedical Research Lab., Fort Rucker, Ala.
AEROMEDICAL EVALUATION OF THE ARMY MOLECULAR SIEVE OXYGEN GENERATOR AMSOG SYSTEMS
Frank S. Pettyjohn, Roderick J. McNeil, Lloyd A. Akers, George P. Rice, and Charles F. Piper Mar. 1977 27 p
(AD-A039855; USAARL-77-10) Avail: NTIS HC A03/MF A01 CSCL 01/3

Molecular sieve technology has been considered as an alternative source of oxygen for US Army operational fixed and rotary wing aircraft. With the constraints of weight, size, and electrical power, the Army molecular sieve oxygen generator (AMSOG) appeared to meet operational needs. Initial design was predicated on direct replacement of current oxygen equipment for the two man crew OV-1 Mohawk surveillance aircraft. Initial bench and hypobaric chamber testing demonstrates a capability to provide 90-94% oxygen at sea level using engine bleed or compressed air at 40 PSIG, 20 to 22 liters per minute (LPM), normal temperature 70 F, pressure 760 Torr, dry (NTPD). Ninety-four percent (94%) oxygen is expected to support both physiologic needs and provide denitrogenation capabilities for US Army aircrew. Argon is concentrated to levels of 6-8% and is considered to be low; however, physiologic effects have not been fully defined. In-flight studies and toxicology evaluation are continuing. Author (GRA)

N77-30755# Navy Clothing and Textile Research Unit, Natick, Mass.
EVALUATION OF A VORTEX TUBE COOLER Final Technical Report
Arthur H. Chadwick Apr. 1977 19 p
(AD-A039708; NCTRF-TR-126) Avail: NTIS HC A02/MF A01 CSCL 13/1

The Navy Clothing and Textile Research Facility (NCTRF) tested a commercial vortex tube cooler for personnel air conditioning to accumulate data for possible future applications. The vortex cooler had six interchangeable nozzles which allowed various cold flow ranges from 7 to 24 cubic feet per minute. The unit was tested in each configuration to determine the various available flows and temperatures. When the unit was supplied with air at a nominal 95 psig, its temperature fell 40, 49, 51, 56, 47, and 52 F with flows of 21, 16, 12, 9, 8, and 7 cubic feet per minute, respectively, at sea level pressures. Based on the amount of cooling available, only the first four configurations would provide ample cooling for suited personnel. Author (GRA)

N77-30756# Southwest Research Inst., San Antonio, Tex.
SAFETY HELMET PERFORMANCE INVESTIGATION, VOLUME 2 Final Report, 1 Nov. 1974 - 1 Mar. 1975
T. D. Dunham, A. Nagy, and S. B. Hugg May 1977 314 p refs
(Contract DOT-HS-4-00802)
(PB-267553/6; SwRI-02-3820-Vol-2; DOT-HS-802378-Vol-2) Avail: NTIS HC A14/MF A01 CSCL 06Q

Best available helmets to meet the head injury criterion proposed in the motorcycle helmet notice of September 1974 are outlined. Motorcycle headform sizes A, B, C, and D were evaluated. These data indicated that the dimensions of size C headforms were not within acceptable tolerance and recommendations were made to require that these tolerances be met. GRA

N77-30757+ Advisory Group for Aerospace Research and Development, Paris (France).
HUMAN FACTORS TOPICS IN FLIGHT SIMULATION: AN ANNOTATED BIBLIOGRAPHY
S. Hunter (RAF Inst. of Aviation Med.), A. J. Gundry (RAF Inst. of Aviation Med.), and J. M. Rolfe (RAF Inst. of Aviation Med.) Jun. 1977 142 p refs
(AGARD-R-656; ISBN-92-835-1246-4) Avail: NTIS HC A07

This bibliography contains 504 references, with summaries, to reports concerned with human factors topics in flight simulation. Reports dealing solely with the engineering aspects of flight simulation have been excluded, unless they contain items of human interest. The bibliography, covering the years 1940 to 1976, is mainly comprised of English-language reports and contain no reference to classified material. Author

55 PLANETARY BIOLOGY

Includes exobiology and extraterrestrial life.

No abstracts in this category.

59 MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

No abstracts in this category.

60 COMPUTER OPERATIONS AND HARDWARE

Includes computer graphics and data processing.

For components see *33 Electronics and Electrical Engineering*.

N77-30758 Illinois Univ., Urbana-Champaign.
CHARACTERIZATION OF A DISTRIBUTED DATA BASE SYSTEM Ph.D. Thesis
Enrique Grapa 1976 179 p
Avail: Univ. Microfilms Order No. 77-9005

Models for update synchronization are presented and extensively studied: (1) the Johnson's model, which basically assumes that undates are handled in the decentralized fashion; (2) the Bunch's model, which introduces the concept of a centralized scheme; and the reservation center model which combines various centralized and decentralized concepts. Major flaws of the models are discussed and extensions are presented to cover them. The broadcasting model, an extension of Bunch's model, is presented as a prototype of a workable generalized distributed data base system. Dissert. Abstr.

N77-30759 Stanford Univ., Calif.
A STORAGE STRUCTURE MODEL FOR DATA BASE

DESIGN Ph.D. Thesis
Liselotte Vicki Therp 1976 160 p
Avail: Univ. Microfilms Order No. 77-7176

A methodology for the design of a storage structure is proposed. The methodology is based on two models: (1) a problem definition model that describes the data model to be supported by the storage structure and statistical information about the data and the application; (2) a storage structure model from which it is possible to calculate the performance of a storage structure for a given set of applications. The methodology also includes a search strategy that can be used to find all efficient storage structures for a given set of applications. The storage structure model developed gives a description of physical sequentialities and pointer sequentialities in the stored data by means of precedence matrices which provide a convenient tool for the performance calculations. Dissert. Abstr.

N77-30760 Northwestern Univ., Evanston, Ill.
A GENERALIZED ACCESS PATH MODEL FOR RELATIONAL, HIERARCHICAL, AND NETWORK DATA BASE SYSTEMS Ph.D. Thesis
Robert Steven Kaplan 1976 101 p
Avail: Univ. Microfilms Order No. 77-10047

An Access Path Producing Language (APPLE) is developed which permits data base users to formulate completely nonprocedural queries. This simple, high level language is designed so that a user need only have minimal knowledge of the physical and logical structure of the data base being accessed. A generalized access path model is developed which permits the system to resolve APPLE queries irrespective of which data model is being used. Two major classes of access path problems associated with the generalized access path model are investigated. One class of problems involves the determination of whether or not a particular path is correct. A second class of problems deals with the resolution of ambiguous queries which can easily be expressed in APPLE. Several approaches to solving these problems are presented. Based on the results some problems in the fields of data translation and subschema/schema are identified.
Dissert. Abstr.

N77-30761 State Univ. of New York, Stony Brook.
A SIMULATION MODEL FOR DATA BASE SYSTEMS Ph.D. Thesis
Peter I. Scheuerman 1976 196 p
Avail: Univ. Microfilms Order No. 77-7782

A systematic methodology is presented for the design of a simulation model which can serve as an aid in the process of selecting storage structures. The model is basically oriented toward the performance evaluation of a given system in terms of retrieval workload, with the storage utilization cost obtained as a byproduct. The different measures of performance are obtained by running a sample of queries with a specified distribution against the given logical data base, which is also of stochastic nature, and the selected file organization. Two important design principles have been the concern of the approach: (1) to allow for various levels of detail in the physical implementation (in terms of access paths, encoding to specific storage structures and device specifications) and, (2) to run the model at a reasonable cost in order to justify its practical use. Dissert. Abstr.

N77-30762 Iowa State Univ. of Science and Technology, Ames.
MULTICENTERED COMPUTER ARCHITECTURE FOR REAL-TIME DATA ACQUISITION AND DISPLAY Ph.D. Thesis
Larry J. Ellis 1976 203 p
Avail: Univ. Microfilms Order No. 77-10310

The architectural concepts of multicentered computers were investigated. It was shown that design process for these systems depends upon the coherent, integrated application of all available technologies to the solution of the real time data acquisition display problem. Dissert. Abstr.

N77-30763# Federal COBOL Compiler Testing Service, Washington, D. C.
THE DOD COBOL COMPILER VALIDATION SYSTEM
George N. Baird 9 May 1977 10 p refs
(AD-A039747; FCCTS/TR-77/03) Avail: NTIS HC A02/MF A01 CSCL 09/2

This technical report goes into the history of COBOL compiler validations. It describes several early efforts by various committees and of different agencies within the Federal Government. The main thrust of the report is the COBOL Compiler Validation System which was produced by the Department of the Navy after participating in, and reviewing the, results of the less than successful efforts that preceded the work of the Navy. It discusses the implementation problem surrounding the CCVS (which would be applicable to any COBOL system) and the automated source program libraries (VP-routine) developed to speed up the implementation by resolving implementor-names, providing a technique for updating the source program, and generating the necessary Job Control Language necessary to compile and execute each of the audit routines making up the CCVS. Author (GRA)

N77-30764# Federal COBOL Compiler Testing Service, Washington, D. C.
THE NAVY FORTRAN VALIDATION SYSTEM
Patrick M. Hoyt 9 May 1977 27 p refs
(AD-A039770; FCCTS/TR-77/18) Avail: NTIS HC A03/MF A01 CSCL 09/2

The FORTRAN Compiler Validation System (FCVS) developed by the Department of the Navy tests the conformance of those elements of the FORTRAN language which are contained in the logical intersection of the American Standard FORTRAN, X3.9-1966, and the elements proposed for the subset language in the draft proposed American National Standard Programming Language FORTRAN. This paper discusses the development of the FORTRAN Compiler Validation System and presents the rationale for the FCVS. The design criteria for the FCVS and a description of the test production is explained. The capabilities of the Executive System are described as well as the future developments anticipated for the FCVS because of the adoption of the revised FORTRAN Standard and the impact of the CODASYL FORTRAN Data Base Facility. Author (GRA)

N77-30765# Federal COBOL Compiler Testing Service, Washington, D. C.
EXPERIENCES IN COBOL COMPILER VALIDATION
George N. Baird and Margaret M. Cook 9 May 1977 6 p refs Presented at Natl. Computer Conf., 1974
(AD-A039746; FCCTS/TR-77/06) Avail: NTIS HC A02/MF A01 CSCL 09/2

This technical paper goes into the subject of software verification, COBOL compiler validation in particular. This research is a result of the work performed by the Federal COBOL Compiler Testing Service (FCCTS). This organization is the only one of its kind in the Federal Government in that it deals with the quality assurance of software. The paper discusses why to validate software, the scope of software validation as well as the COBOL Compiler Validation System (CCVS) used by the FCCTS in performing its mission of validating all COBOL compilers brought into the Federal inventory. Author (GRA)

N77-30766# Federal COBOL Compiler Testing Service, Washington, D. C.
AN OVERVIEW OF THE 1974 COBOL STANDARD
Margaret M. Cook, George N. Baird, William M. Holmes, Patrick M. Hoyt, L. Arnold Johnson, and Paul Oliver 9 May 1977 8 p refs Presented at Natl. Computer Conf., 1975
(AD-A039680; FCCTS/TR-77/12) Avail: NTIS HC A02/MF A01 CSCL 09/2

In May 1974, the American National Standards Institute approved ANS Programming Language COBOL, X3.23-1974 as the national standard for the COBOL language replacing USA Standard COBOL, X3.23-1968. Federal Information Processing Standards Publication 21-1 adopts X3.23-1974 (minus the Report Writer module) as the Federal COBOL Standard. As a result of these actions, the Federal COBOL Compiler Testing Service is engaged in the development of a new COBOL compiler Validation System, incorporating tests for the revised language. This paper presents an overview of COBOL 74, highlighting the new features in the language, major language deficiencies, and important contributions to the programming discipline. Author (GRA)

N77-30767# Federal COBOL Compiler Testing Service, Washington, D. C.
AN EXPERIMENT IN THE USE OF SYNTHETIC PROGRAMS

FOR SYSTEM BENCHMARKING
Paul Oliver 9 May 1977 9 p refs Presented at Natl. Computer Conf., 1974
(AD-A039744; FCCTS/TR-77/07) Avail: NTIS HC A02/MF A01 CSCL 09/2

The Federal COBOL Compiler Testing Service has experimented with the use of synthetic programs for system benchmarking. The results of this experiment are discussed here. Author (GRA)

N77-30768# Federal COBOL Compiler Testing Service, Washington, D. C.
STRUCTURED PROGRAMMING USING COBOL 74
Paul Oliver and George N. Baird 9 May 1977 6 p refs
(AD-A039745; FCCTS/TR-77/09) Avail: NTIS HC A02/MF A01 CSCL 09/2

Structural modularity in COBOL programming is achievable through variations of structured programming. The advantages of this approach as shown in a particular case study for a system reprogrammed using a structured approach. This paper also discusses the problems, approaches, techniques associated with the advancement, development, and implementation of structured programming using COBOL 74. Particular attention is given to micromodularity and to the costs, at the instruction level, of using a structured approach. Specific examples using several compilers are presented. Also examined will be those features in COBOL which are detrimental to structured programming and alternatives to using these features. Author (GRA)

N77-30769# Federal COBOL Compiler Testing Service, Washington, D. C.
PROGRAM DEBUGGING USING COBOL 74
George N. Baird 9 May 1977 7 p refs Presented at Natl. Computer Conf., 1975
(AD-A039743; FCCTS/TR-77/14) Avail: NTIS HC A02/MF A01 CSCL 09/2

This technical paper discusses the Debugging features of COBOL 74 (American National Standard Programming Language COBOL X3.23-1974). The formal COBOL specifications up until COBOL 74 totally ignored the problem of debugging programs at the source level. This paper discusses some of the methods by which the various vendors who produce COBOL compilers attempted to break the problem by providing language extensions to their compilers. It goes into the COBOL 74 debugging features in great detail as well as provides numerous examples of using debug lines in the source code debug procedures in the Declarative portion of the source program. Author (GRA)

N77-30770# Federal COBOL Compiler Testing Service, Washington, D. C.
HYPO-COBOL: A COBOL SUBSET FOR MINICOMPUTERS
Margaret M. Cook and George N. Baird 9 May 1977 20 p refs
(AD-A039742; FCCTS/TR-77/16) Avail: NTIS HC A02/MF A01 CSCL 09/2

The HYPO-COBOL language is a COBOL subset designed for implementation in mini-computer and time-sharing environments which impose resource limitations. The HYPO-COBOL subset in a small scale package which could provide basic capabilities, yet still not make extreme demands on system resources during compilation. It is intended as an alternative to full COBOL for those users who do not require the complete COBOL language. The base document from which the specifications for the HYPO-COBOL language were developed was American National Standard Programming Language COBOL, X3.23-1974. The HYPO-COBOL language consists of subsets of the Nucleus and five functional processing modules; Table Handling, Sequential I-O, Relative I-O, Debug and Inter-Program Communication. This paper presents the background and reasons for the definition of the HYPO-COBOL language, and the design features and rationales of the language. A HYPO-COBOL Compiler Validation System for determining compliance to the specifications has been developed and is also described. Author (GRA)

N77-30771# Federal COBOL Compiler Testing Service, Washington, D. C.
TRANSFERABILITY OF FORTRAN BENCHMARKS
Paul Oliver 9 May 1977 13 p refs
(AD-A039741; FCCTS/TR-77/13) Avail: NTIS HC A02/MF A01 CSCL 09/2

Although FORTRAN is a relatively simple language, its wide acceptance has resulted in a variety of extensions, and this proliferation of dialects greatly hampers the transferability of FORTRAN programs. It must be said at the outset that complete transferability is probably not achievable, due to irreconcilable differences in machine architectures. Portable programs can, however, be produced with the aid of appropriate software tools. The most systematic and comprehensive attempt at producing portable FORTRAN programs has been the development of PFORTRAN. GRA

N77-30772# Federal COBOL Compiler Testing Service, Washington, D. C.
PROGRAMMING LANGUAGE STANDARDS: WHO NEEDS THEM
George N. Baird and Paul Oliver 9 May 1977 29 p refs
(AD-A039740; FCCTS/TR-77/17) Avail: NTIS HC A03/MF A01 CSCL 09/2

The programming language standards used in the United States are produced and maintained by the American National Standards Institute. The standards produced by ANSI are voluntary in that they can be either (ANSI) adopted or ignored by the community which they effect. The first programming language to be standardized was FORTRAN in 1966, followed by COBOL in 1968. The COBOL standard was updated and revised in 1974. The proposed revision to the FORTRAN standard is also close to being adopted. We can now take a look at what the impact that language standardization has had on the user community. This paper addresses the standardization process as reviewed by COBOL, FORTRAN, and PI/I committees. COBOL will be addressed in greater detail due to the timing and impact of the revised COBOL standard. Author (GRA)

N77-30773# Federal COBOL Compiler Testing Service, Washington, D. C.
THE STANDARDIZATION AND EVOLUTION OF THE COBOL LANGUAGE
Patrick M. Hoyt, George N. Baird, Margaret M. Cook, William M. Holmes, L. Arnold Johnson, and Paul Oliver 9 May 1977 6 p refs
(AD-A039739; FCCTS/TR-77/11) Avail: NTIS HC A02/MF A01 CSCL 09/2

Government-wide testing of COBOL compilers is the responsibility of the Federal COBOL Compiler Testing Service, an activity of the Department of the Navy's Automatic Data Processing Equipment Selection Office, Software Development Division. In May 1974, the American National Standards Institute approved ANS Programming Language COBOL, X3.23-1974 as the national standard for the COBOL language. Specifications for this revision were drawn from USA Standard COBOL X3.23-1968 and the CODASYL COBOL Journal of Development, dated 31 December 1971. As a result, the Testing Service is engaged in the development of a COBOL Compiler Validation System for this new Standard, incorporating tests for the revised language into the existing 1968 COBOL Compiler Validation System. The first part of the paper focuses on the rationale behind changes from the '68 to '74 COBOL Standard as well as highlighting the new features in the language. The second part of the paper discusses evolution within the COBOL language itself with respect to the CODASYL COBOL Journal of Development and several other CODASYL language activities.
Author (GRA)

N77-30774# Federal COBOL Compiler Testing Service, Washington, D. C.
SYSTEM FOR EFFICIENT PROGRAM PORTABILITY
George N. Baird and L. Arnold Johnson 9 May 1977 8 p refs Presented at Natl. Computer Conf., 1974
(AD-A034738; FCCTS/TR-77/08) Avail: NTIS HC A02/MF A01 CSCL 09/2

This technical paper describes a software system (written in COBOL 68 - X3.23-1968) designed to ease the pains of converting COBOL programs and their related data to different systems or to different software environments within the same computer system. The approach taken is novel in that two processes take place. The first process is to covert the source programs to a

system independent form of COBOL. As a result of examining the source program during the source program conversion phase, the information found in the File Section is used to produce data file translation - COBOL programs which can read the data file on the old system, produce a system independent data file, read the system independent data file on the new system and convert it to a file on the new system which will take advantage of the new architecture of the hardware/software. The source program conversion processor took this into account and the converted source program will be able to process the new file with little or no modification. Author (GRA)

N77-30775# Federal COBOL Compiler Testing Service, Washington, D. C.
COBOL COMPILER VALIDATION SUMMARY REPORT
9 May 1977 45 p
(AD-A039189; CCVS68-VSR220) Avail: NTIS HC A03/MF A01 CSCL 09/2

This Validation Summary Report (VSR) for the IBM OS/VS COBOL Compiler Version 4 R1.4 (OS/MVT Version 21.8/HASP 3.1) provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1968 COBOL Standard (X3.23-1968/FIPS PUB 21). The compiler was validated at the High level of FIPS PUB 21. The VSR is made up of several sections showing the discrepancies found. These include an overview of the validation which lists all categories of discrepancies by level/module within X3.23-1968; a section relating the categories of discrepancies to each of the Federal levels of the language; and a detailed listing of discrepancies together with the tests which were failed.
Author (GRA)

N77-30776# Sacramento Air Logistics Center, McClellan AFB, Calif. Data Automation Branch.
COMPARISON OF COMPUTER OUTPUT MEDIA. 1 COMPUTER PRINTER. 2. XEROX COMPUTER FORMS PRINTER (CFP). 3. XEROX 1200 COMPUTER PRINTING SYSTEM. 4. IBM 3800 PRINTING SUBSYSTEM. 5. COMPUTER OUTPUT MICROFICHE (COM) Final Report
Vernon M. Crawford 9 Jan. 1976 54 p
(AD-A039459; SM-ALC/ACD-76-01) Avail: NTIS HC A04/MF A01 CSCL 09/2

This study invoices costs associated with the production of computer products and compares the cost of present computer printers to the cost of using the Xerox Computer Forms Printer (CFP), Xerox 1200 Computer Printing System, IBM 3800 Printing Subsystem or Computer output Microfiche (COM). The study is twofold. It first considers the cost of processing all multipart paper products on each of the alternate systems. The second consideration is a 40% conversion of these products to microfiche with the remaining products being processed on either the Xerox CFP, IBM 3800 or Xerox 1200. The anticipated 40% conversion to microfiche is based on studies in private industry and has been reviewed by Mr Steve Long, Federal Electric Corp, at Vanengberg AFB, who has been involved in computer-output-microfiche production for some time. Single part paper products were not considered for conversion in this report since we feel that some computer printouts will still be required from the standpoint of convenience, and because the savings involved are minimal. Also, computer printers will still be required for certain special forms even though the Xerox and IBM equipment does have a forms overlay capability. Author (GRA)

N77-30777# Ballistic Research Labs., Aberdeen Proving Ground, Md.
AN APPLICATION OF CREATABASE: A MODULE OF AN INTEGRATED DATA BASE ANALYSIS SYSTEM
Morton A. Hirschberg Apr. 1977 22 p refs
(AD-A039304; BRL-1979) Avail: NTIS HC A02/MF A01 CSCL 09/2

CREATABASE, a module of an integrated data base analysis system, was used to construct a data base comprised of 10,000 observations collected during 31 tests conducted at the Ballistic Research Laboratory, Aberdeen Proving Ground, Maryland. Uses of the data base as well as other applications of CREATABASE are discussed, and the data base and the commands to implement it are also presented. Author (GRA)

N77-30778# Naval Electronics Lab. Center, San Diego, Calif.
MICROCOMPUTERS AND SYSTEMS DESIGN. ELECTRONIC SYSTEMS CAN HAVE BUILT-IN COMPUTATIONAL AND SELF TEST CAPABILITIES
William J. Dejka 15 Feb. 1977 71 p refs
(AD-A039227; NELC/TD-507) Avail: NTIS HC A04/MF A01 CSCL 09/2

As the result of the continuing advances in microelectronics, the capability of today's minicomputer will soon be able to reside on a single chip. When this projection grows into reality, computers will no longer be needed as separate systems. Rather, individual application oriented electronic systems will have built-in computational capabilities, from the component level to the highest man-machine levels. They will be capable of self tests and repair and will be reconfigurable. As the state of the art advances, system design itself will become programmable. Author (GRA)

N77-30779# Naval Postgraduate School, Monterey, Calif.
A SHARED ENVIRONMENT FOR MICROCOMPUTER SYSTEM DEVELOPMENT M.S. Thesis
Kenneth Brown and David R. Bullock Mar. 1977 221 p refs
(AD-A039695) Avail: NTIS MF A01 CSCL 09/2

A timeshared microcomputer monitor for Intel 8080 microprocessor systems development has been described. Running on the Sycor 440 Clustered Terminal Processing System, the monitor provides a virtual environment composed of a console device, eight floppy disk drives, and an 8080 microprocessor for up to four concurrent users. Virtual floppy disk files on a five megabyte movable-head disk provide the system's primary auxiliary storage medium. Three different levels of access protection are available for these virtual floppy disk images. A command language processor has been included to support on-line modification of the virtual environment. System recovery in the event of a hardware or software failure is also supported by the monitor. Author (GRA)

N77-30780# Naval Postgraduate School, Monterey, Calif.
AN INTERACTIVE COMPUTER INTERFACE WITH A DIGITAL RECEIVER M.S. Thesis
William Glenn Borries Mar. 1977 127 p refs
(AD-A039950) Avail: NTIS MF A01 CSCL 09/2

A computer interface to connect both the Applied Technology Airborne Computer (ATAC) and the KIM-1 Microprocessor to a Watkins Johnson digitally tuned receiver was designed and constructed. The existing ATAC computer program was modified. Author (GRA)

N77-30781# Naval Postgraduate School, Monterey, Calif.
AN INVESTIGATION OF A FORTRAN GRAMMAR FOR USE WITH A MICROPROCESSOR BASED LALR(1) TRANSLATOR WRITING SYSTEM M.S. Thesis
Joan Marie Russell Mar. 1977 71 p refs
(AD-A039969) Avail: NTIS MF A01 CSCL 09/2

The design and implementation of an LALR(1) FORTRAN grammar has been described. Design requirements and recommendations for a 16K byte microcomputer system, which would allow the use of the FORTRAN programming language as defined by the grammar implementation, have been presented. The proposed system consisted of three subsystems: a FORTRAN compiler based on the grammar implementation which produced an immediate language, a linking-loader that enabled independently compiled program units to be linked, and an interpreter that executed the intermediate language on the specific target machine. Author (GRA)

N77-30782# Boeing Aerospace Co., Seattle, Wash.
SOFTWARE ERROR DATA ACQUISITION Final Technical Report, Feb. - Nov. 1976
M. J. Fries Griffiss AFB, N. Y. RADC Apr. 1977 62 p refs (Contract F30602-76-C-0152)
(AD-A039916; RADC-TR-77-130) Avail: NTIS HC A04/MF A01 CSCL 09/2

Software error data was collected from a large DOD system development project. The errors were analyzed and put into a predefined set of categories. As part of the effort, the times to find and fix the errors were calculated, and the phase of the development project in which the errors arose was determined. Study results were also compared to results of a similar type of

study performed by a second contractor who performed analysis of data from another DOD software project. This report contains a description of the hardware and software systems, the software development process, and the types of data available. Also included are descriptions of the method of categorization and the derivation of other contractually required data items. Finally, discussions are presented concerning: an interpretation of the software error categories, comments on the difficulties and successes in performing the error data collection, an analysis of the data collected by software function, study results, examination of the data by development phase, and recommendations for future software data collection studies. Author (GRA)

N77-30783# Naval Surface Weapons Center, White Oak, Md.
PROGRESS TOWARD THE CROSSTIE MEMORY IV Interim Report, Oct. 1975 - Oct. 1976
L. J. Schwee, W. E. Anderson, H. R. Irons, O. J. VanSant, Jr., and J. W. McCorkle 1 Oct. 1976 52 p
(WF54545602)
(AD-A039850; NSWC/WOL/TR-77-21) Avail: NTIS HC A04/MF A01 CSCL 09/2

This is the fourth annual technical report of progress toward the crosstie memory and it emphasizes the work done during the past year. In the crosstie memory, information is stored, propagated and detected in magnetic domain walls of Permalloy films about 370 A thick. Serrated edges on narrow thin film permalloy strips are used to center a domain wall in each strip and provide stable positions for crossties and Bloch lines. The magnetoresistance effect in the information bearing film is used for detection. The anticipated performance of the crosstie memory includes a shift rate of 20,000,000 bits/sec, a bit density greater than 150,000 bits/sq cm, an operating temperature range from -50 C to 100 C, nonvolatility, low cost and low power consumption. At this time all the necessary functions associated with the shift registers have been demonstrated and shown to be compatible. Present emphasis is being placed on widening the margins of operation so that a reliable and manufacturable device will result. Author (GRA)

N77-30784# Massachusetts Univ., Amherst. Dept. of Computer and Information Science.
COMPUTATIONAL TECHNIQUES IN THE VISUAL SEGMENTATION OF STATIC SCENES Interim Report
E. M. Riseman and Michael A. Arbib Mar. 1977 117 p refs Revised
(Contract N00014-75-C-0459; Grants NSF DCR-75-16098; NS-09755-06COM)
(AD-A039665; COINS-TR-77-4) Avail: NTIS HC A06/MF A01 CSCL 09/2

A wide range of segmentation techniques continues to evolve in the literature on scene analysis. Many of these approaches have been constrained to limited applications or goals. This survey analyzes the complexities encountered in applying these techniques to color images of natural scenes involving complex textured objects. It also explores new ways of using the techniques to overcome some of the problems which are described. An outline of considerations in the development of a general image segmentation system which can provide input to a semantic interpretation process is distributed throughout the paper. In particular, the problems of feature selection and extraction in images with textural variations are discussed. The approaches to segmentation are divided into two broad categories, boundary formation and region formation. The tools for extraction of boundaries involve spatial differentiation, non-maxima suppression, relaxation processes, and grouping of local edges into segments. Approaches to region formation include region growing under local spatial guidance, histograms for analysis of global feature activity, and finally an integration of the strengths of each by a spatial analysis of feature activity. A brief discussion of attempts by others to integrate the segmentation and interpretation phases is also provided. The discussion is supported by a variety of experimental results. Author (GRA)

N77-30785# Federal COBOL Compiler Testing Service, Washington, D. C.
FORTRAN COMPILER VALIDATION SUMMARY REPORT
1977 18 p
(AD-A040128; ECVS66-VSR215) Avail: NTIS HC A02/MF A01 CSCL 09/2

This Validation Summary Report (VSR) for the IBM 360/370 'CODE and GO' FORTRAN Compiler Version 3.0 (OS Version 21.8) provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1966 FORTRAN Standard (X3.9-1966). The VSR is made up of several sections showing the discrepancies found. These include an overview of the validation which lists all categories of discrepancies; a section relating the categories of discrepancies to the language; and a detailed listing of discrepancies together with the tests which were failed. Author (GRA)

N77-30786# Federal COBOL Compiler Testing Service, Washington, D. C.
VALIDATION SUMMARY REPORT IBM 360/370 FORTRAN 4 G
17 May 1977 18 p
(AD-A040392; FCVS66-VSR210) Avail: NTIS HC A02/MF A01 CSCL 09/2

This Validation Summary Report (VSR) for the IBM 360/370 'G' FORTRAN Compiler Version 21.0 (OS Version 21.8) provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1966 FORTRAN Standard (X3.9-1966). The VSR is made up of several sections showing the discrepancies found. These include an overview of the validation which lists all categories of discrepancies; a section relating the categories of discrepancies to the language; and a detailed listing of discrepancies together with the tests which were failed. Author (GRA)

N77-30787# Air Force Human Resources Lab., Brooks AFB, Tex.
METHOD FOR COMPENSATING TRANSPORT LAGS IN COMPUTER IMAGE GENERATION VISUAL DISPLAYS FOR FLIGHT SIMULATION Final Report
Michael L. Cyrus Mar. 1977 11 p refs
(AD-A040551; AFHRL-TR-77-6) Avail: NTIS HC A02/MF A01 CSCL 05/9

This paper examines an analytical technique for simultaneously compensating transport delays in Computer Image Generation (CIG) visual systems, while eliminating high frequency 'flutter' effects. Author (GRA)

N77-30788# National Physical Lab., Teddington (England). Div. of Chemical Standards.
THE NPL 'MTDATA'-BANK AND ITS APPLICATION TO THERMODYNAMIC COMPUTATION ON INORGANIC AND METALLURGICAL SYSTEMS
G. P. Jones May 1977 24 p refs
(NPL-Chem-70) Avail: NTIS HC A02/MF A01

A description is given of the main principles and capabilities of NPL's Inorganic and Metallurgical Thermodynamic Data-bank 'MTDATA'. Its utility as an aid to research on reactions which may be undergone by materials at high temperatures, where equilibrium conditions are often approached, is indicated by selected examples. Author (ESA)

N77-30789# Federal COBOL Compiler Testing Service, Washington, D. C.
FORTRAN COMPILER VALIDATION SUMMARY REPORT
17 May 1977 18 p
(AD-A040355; FCVS66-VSR200) Avail: NTIS HC A02/MF A01 CSCL 09/2

This Validation Summary Report (VSR) for the UNIVAC 1100 Series ASCII Fortran Compiler Version 6R6 (EXEC 8 Level 33R1) provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1966 FORTRAN Standard (X3.9-1966). The VSR is made up of several sections showing the discrepancies found. These include an overview of the validation which lists all categories of discrepancies; a section relating the categories of discrepancies to the language; and a detailed listing of discrepancies together with the tests which were failed. Author (GRA)

N77-30790# Cornell Univ., Ithaca, N.Y. Dept. of Computer Sci.
INDEPENDENCE RESULTS IN COMPUTER SCIENCE
J. Hartmanis and J. E. Hopcroft Dec. 1976 13 p refs

(Contract N00014-76-C-0018; NSF DCR-75-09433)
(AD-A040710; CU-CSD-TR-76-296) Avail: NTIS HC A02/MF A01 CSCL 09/2

During the last few years research in theoretical computer science has identified several problems whose solution seems to be important for the further development of the field and on which a considerable amount of research effort has been expended. In spite of all this effort these problems remain unsolved and, no real progress seems to have been made toward their solution. Nevertheless, there remains real optimism that they will be solved and a deeply ingrained conviction that they can be solved. This note points out that many of these problems may not have a solution in formalized mathematical systems; more specifically, proof is shown that the solutions of many instances of these problems are independent of the axioms of set theory. GRA

N77-30791# Massachusetts Inst. of Tech., Cambridge. Lab. for Computer Science.
NON-DISCRETIONARY ACCESS CONTROL FOR DECENTRALIZED COMPUTING SYSTEMS M.S. Thesis
Paul Ashley Karger May 1977 137 p refs
(Contract N00014-75-C-0661; ARPA Order 2095)
(AD-A040808; MIT/LCS/TR-179; ESD-TR-77-142) Avail: NTIS HC A07/MF A01 CSCL 09/2

This thesis examines the issues relating to non-discretionary access controls for dencentralized computing systems. Decentralization changes the basic character of a computing system from a set of processes referencing a data base to a set of processes sending and receiving messages. Because messages must be acknowledged, operations that were read-only in a centralized system become read-write operations. As a result, the lattice model of non-discretionary access control, which mediates operations based on read versus read-write considerations does not allow direct transfer of algorithms from centralized systems. This thesis develops new mechanisms that comply with the lattice model and provide the necessary functions for effective decentralized computation. Secure protocols at several different levels are presented in the thesis. GRA

N77-30792# National Transportation Safety Board, Washington, D. C. Bureau of Accident Investigation.
AIRCRAFT ACCIDENT REPORT. AIR CHICAGO FREIGHT AIRLINES, INC., NORTH AMERICAN TB-25N, N94462, MIDWAY AIRPORT, CHICAGO, ILLINOIS, AUGUST 6, 1976 Aircraft Accident Report
14 Apr. 1977 25 p
(NTISUB/C/104-003; NTSB-AAR-77-3) Avail: NTIS HC A02/MF A01 CSCL 07D

On August 6, 1976, N9446Z crashed while attempting an emergency landing at Midway Airport, Chicago. The left engine failed during climbout from Midway Airport, which precipitated an uncontrollable engine fire. The probable cause of the accident was the deterioration of the cockpit environment, due to smoke to the extent that the crew could not function effectively in controlling the aircraft under emergency conditions. The smoke and fire, originating from a massive failure in the power section of the left engine, propagated into the bomb bay area and then into the cockpit. The inspection system utilized was not effective in detecting the impending engine failure. GRA

N77-30793# Rochester Univ., N. Y. Graduate School of Management.
THE ECONOMICS OF SECONDARY STORAGE BACKUP Final Report
Richard E. West Dec. 1976 17 p
(Grant NSF NM-44241)
(PB-267089/1) Avail: NTIS HC A02/MF A01 CSCL 09B

The costs and benefits of making storage backups as well as the techniques used to optimally perform storage backup on a Hewlett-Packard 2000 Timesharing System are examined. GRA

N77-30794# Purdue Univ., Lafayette, Ind. Krannert Graduate School of Management.
OBSERVATIONS ON A GENERALIZED INTELLIGENT QUERY PROCESSOR FOR DECISION SUPPORT
R. H. Bonczek, C. W. Holsapple, and A. B. Whinston 1976 44 p
(Contract DI-14-34-0001-6076)
(PB-267472/9; W77-07849; OWRT-b-080-IND(7)) Avail: NTIS HC A03/MF A01 CSCL 09B

A query processor is described which has the capacity to treat a broad spectrum of formal decision making applications. For example, the same query processor may be used in such diverse decision support applications as water quality management and material requirements planning. Moreover, within an area such as water quality management, alterations in the types of formal analysis to be performed do not affect the query processor. GRA

N77-30795# Purdue Univ., Lafayette, Ind. Inst. for Research in the Behavioral, Economic, and Management Sciences.
INFORMATION TRANSFERRAL WITHIN A DISTRIBUTED DATA BASE VIA A GENERALIZED MAPPING LANGUAGE
R. C. Bonczek, C. W. Holsapple, and A. B. Whinston Nov. 1976 39 p refs
(Contract DI-14-34-0001-6076)
(PB-267343/2; Paper-577; W77-07813; OWRT-B-080-IND(5)) Avail: NTIS HC A03/MF A01 CSCL 13B

A generalized mapping language is proposed as a mechanism for information transferral within a distributed data base, and a general data structure for supporting the mapping function is illustrated. The method accommodates a variety of user views, is independent of whether the data base is geographically distributed or centralized, furnishes a straightforward 'security mechanism and provides a basis for treating the contingency of uninformed or non-programming users. The realm of water quality management is used to illustrate the technique. GRA

N77-30796# Purdue Univ., Lafayette, Ind. Krannert Graduate School of Management.
AIDING DECISION MAKERS WITH A GENERALIZED DATA BASE MANAGEMENT SYSTEM: AN APPLICATION TO INVENTORY MANAGEMENT
Robert H. Bonczek, Clyde W. Holsapple, and Andrew B. Whinston Aug. 1976 32 p refs
(Contract DI-14-34-0001-6076; OWRT Proj. B-080-IND(1))
(PB-267306/9; W77-07814) Avail: NTIS HC A03/MF A01 CSCL 13B

The attributes of a generalized data base management system are examined with respect to its impact on managerial decision-making. Primary considerations are: the organization of data within data base such that all intricate relationships are represented; and the utilization of a facile method for nonprogramming users to interrogate the data base. Examples drawn from the field of material requirements planning are used to illustrate the concepts and potential of the generalized data base management system. GRA

61 COMPUTER PROGRAMMING AND SOFTWARE

Includes computer programs, routines, and algorithms.

N77-30797# Aeronautical Research Labs., Melbourne (Australia).
A GENERAL PURPOSE OUTPUT PROGRAM FOR USE IN SIMULATION
P. G. Nankivel and N. E. Gilbert Dec. 1976 33 p refs
(ARL/Aero. Note-367; AR-236) Copyright. Avail: Issuing Activity

The 'block oriented' simulation language CSMP-10(ARL) consists of a modelling program, which performs the model simulation and stores the output in a binary file, and an output program, which prints and plots the character conversion of the binary file. The output program which is described, is written mainly in FORTRAN IV for a PDP-10 computer and is controlled interactively from a teletype. Although the output program was written primarily to be used in conjunction with the modelling program, it is also used as a general purpose output program by using a supplied subprogram package. The program provides teletype and line printer output in either tabular or graphical form and incremental plotter output in the form of 'strip' or 'overlay' plots. Author

N77-30798 Purdue Univ., Lafayette, Ind.
A QUASI-INTERACTIVE APPROACH TO COMPUTER ASSISTED INSTRUCTION Ph.D. Thesis
Sharon Kay Fletcher 1976 142 p
Avail: Univ. Microfilms Order No. 77-7448

The development of a quasi-interactive approach to CAI courseware presentation is presented based on lengthened student system interaction intervals. When used on general purpose (non-dedicated) computing facilities results are in lower cost and lower impact on the host system. The low cost quasi-interactive approach makes practical the use of CAI by large numbers of students, without the need to turn to expensive dedicated equipment. The courseware structure which was developed is based on the concept of a task, a unit of information, directions, questions, etc., to be presented to the student, requiring that some response be made by the student after some time delay. The task also contains correct, and possibly anticipated wrong, responses and feedback of several types. Dissert. Abstr.

N77-30799 Illinois Univ., Urbana-Champaign.
EXPERIMENTAL AND FORMAL LANGUAGE DESIGN APPLIED TO CONTROL CONSTRUCTS FOR INTERACTIVE COMPUTING Ph.D. Thesis
David Wayne Embley 1976 139 p
Avail: Univ. Microfilms Order No. 77-8984

Various approaches to language design are examined, and are applied to an exploration of control constructs for interactive computing, particularly in computer aided instruction (CAI). A control construct is examined that handles CAI answer judging and unifies selection and iteration. A static exception processing scheme is also examined. A number of experiments tested these constructs and at the same time illustrated a methodology for conducting experiments on line in a CAI environment. In the investigation, several design principles evolved. Dissert. Abstr.

N77-30800 Texas Technological Univ., Lubbock.
A UNIFIED APPROACH TO DEVELOPMENT OF HIGH-LEVEL LANGUAGE PROGRAMS FOR MICROPROCESSORS Ph.D. Thesis
Kuppusami Chettiar Chennappan 1976 126 p
Avail: Univ. Microfilms Order No. 77-8741

A software package called the GxA (Generalized Cross Assembler) was developed embedding the mapping information of the micron P in it. The GxA, written as a two pass assembler, has the extended capability to cross-assemble any program written in minicomputer source code and to produce the object module in the micron P machine code. The output module in machine code of the target micron P can be conveniently generated on a suitable medium in the micron P compatible format. The object module so generated in the micron P machine code can be stored in a PROM or ROM according to the recognized procedures for the device. The micron P with this program stored in the memory can be used for the intended application. Dissert. Abstr.

N77-30801 Lehigh Univ., Bethlehem, Pa.
THE PRACTICAL IMPLEMENTATION OF STRUCTURED PROGRAMMING LANGUAGES Ph.D. Thesis
John Hargadine Carson 1976 180 p
Avail: Univ. Microfilms Order No. 77-10691

The scope of the language implementation problem involves both software and computer architectural issues. The software system, the translator, operates on the input programming language and produces, as output, an object language program which is to be executed by a virtual computer system. The software system consists of three subsystems: syntactic analysis, semantic analysis, and code generation. The virtual computer system consists of a target computer augmented by some run-time software support routines. The syntactic analysis subsystem translates the input program into a tree structured representation, the abstract syntax tree, which is a concise representation of the relationships between the elements of the programming language. The techniques developed for the semantic analysis subsystem operate on the abstract syntax tree produced by the syntactic analysis subsystem. The final subsystem, the code generation subsystem, closely depends on the virtual machine architecture. Dissert. Abstr.

N77-30802 Pennsylvania State Univ., University Park.
PRIMAL GEOMETRIC PROGRAMS TREATED BY SEQUENTIAL LINEAR PROGRAMMING Ph.D. Thesis
William Hamilton Elliott 1976 160 p
Avail: Univ. Microfilms Order No. 77-9764

Geometric programming (GP) is a powerful technique for solving a wide range of mathematical programming problems that naturally occur in engineering design. A nontrivial primal GP is highly nonlinear and nonconvex, but its dual is composed of linear constraints and a long-concave objective function. Because of this nice structure, the majority of algorithms designed to solve a primal GP do so through its dual. This dual approach is not without problems, however, as the dual objective function is nondifferentiable at the optimal solution when the primal GP contains nonbinding constraints. Two global approaches that solve the primal GP without resorting to the dual are examined and compared. Both approaches utilize a sequence of linear programming subproblems to solve a sequence of linear approximations of the nonlinear primal feasible region. Dissert. Abstr.

N77-30803 Northwestern Univ., Evanston, Ill.
HIGHER-ORDER THEOREM PROVING USING N-SORTED LOGIC Ph.D. Thesis
Karen Starr Ellison 1976 82 p
Avail: Univ. Microfilms Order No. 77-10021

Modifications to a first-order theorem proving program that make possible proving higher-order theorems are developed. This approach is possible if higher-order problems are translated from lambda - calculus to an n-sorted logic which is basically a first-order language. Background material on the resolution method for first-order theorem proving, as well as the translation scheme from lambda - calculus to n-sorted logic is presented. Results upon which the proposed modifications to a first-order system are based are given. The modifications proposed result in a complete theorem-proving program for second-order problems. Dissert. Abstr.

N77-30804 Iowa State Univ. of Science and Technology, Ames.
EXTENSIONS TO A BLOCK-STRUCTURED PROGRAMMING LANGUAGE TO SUPPORT PROCESSING OF SYMBOLIC DATA AND DYNAMIC ARRAYS Ph.D. Thesis
Perry Charles Hutchison 1976 41 p
Avail: Univ. Microfilms Order No. 77-10320

Extensions to SYMBOL programming language (SPL) are proposed to permit the application to structures of the entire set of operations defined upon scalar data, and to facilitate the examination of character-string data by augmenting the capabilities of the string-manipulation operators and defining a pattern-matching operator. The extensions are defined in terms of the existing language. It is claimed that the applicability of the proposed extensions, including the pattern-matching operator and the extended MASK and FORMAT operators, is not limited to SPL but rather encompasses a broad range of programming languages. Dissert. Abstr.

N77-30805 Pennsylvania State Univ., University Park.
DESIGN AND IMPLEMENTATION OF A PROGRAMMING SYSTEM FOR THE PRODUCTION OF TRANSPORTABLE SOFTWARE Ph.D. Thesis
Douglas Edward Whitten 1976 326 p
Avail: Univ. Microfilms Order No. 77-9751

Formal definitions are presented of two distinct types of program portability, and it is shown that these definitions can be used to separate the set of all possible programming languages into two intersecting categories. The extent to which currently existing programming language tends to fall into the category of most limited scope is illustrated. These two definitions of portability, when considered as (potential) attributes of a programming language, provide the means to define a new type of language: a transportable programming language. A programming language is then presented which is specifically designed to be transportable over a wide range of computers. This language, TPL, is derived from the FORTRAN language, and represents a realistic attempt to define an easily implementation programming language embodying a general, and practical, definition of programming language portability. Dissert. Abstr.

N77-30806 Northwestern Univ., Evanston, Ill.
A MINIMUM COST PATH ALGORITHM FOR PRINTED CIRCUIT ROUTING Ph.D. Thesis
James Riley Allen 1976 230 p
Avail: Univ. Microfilms Order No. 77-9995

The problem of finding a minimum-cost path through a weighted graph specifically as it relates to printed circuit routing is studied. An implementation independent algorithm for the solution of the generalized path finding problem is described and proven to produce a minimum-cost path whenever an appropriate path exists. The problem of making the graphical model of the physical routing environment flexible enough to express the wide range of mechanical requirements encountered due to various manufacturing techniques is also studied. A new approach to the edge cost assignment mechanism and to the routing graph model itself resulted in a printed circuit routing program which can be programmed at user command level to produce routed paths which conform to a wide range of different physical constraints and interconnection strategies. An implementation of this algorithm requiring four bits of main memory per routing graph node was coded and demonstrated to produce very favorable results in a production environment.
Dissert. Abstr.

N77-30807 State Univ. of New York, Stony Brook.
COMPUTER ASPECTS OF DYNAMICAL OPTIMIZATION Ph.D. Thesis
San-Yen Shi 1976 80 p
Avail: Univ. Microfilms Order No. 77-10747

Integrated aspects of programming dynamic optimization problems and computer architecture most suited for its execution were considered. The study of commonly used optimization algorithms showed there are 9 frequently used subroutines and 18 secondary operations. By storing these subroutines in computer memory, substantial savings in programming time can be realized.
Dissert. Abstr.

N77-30808*# National Aeronautics and Space Administration. Goddard Inst. for Space Studies, New York.
GENERAL PURPOSE FILM PLOTTING SYSTEM
Christine McQuillan Jun. 1977 89 p
(NASA-TM-X-71366; X-626-77-163) Avail: NTIS HC A05/MF A01 CSCL 09B

The general purpose film plotting system which is a plot program design to handle a majority of the data tape formats presently available under OS/360 was discussed. The convenience of this program is due to the fact that the user merely describes the format of his data set and the type of data plots he desires. It processes the input data according to the given specifications. The output is generated on a tape which yields data plots when processed by the selected plotter. A summary of each job is produced on the printer.
Author

N77-30809# New Jersey Inst. of Technology, Newark.
A FAST BOUNDARY TRACKING ALGORITHM FOR CONSTRAINED NONLINEAR MATHEMATICAL PROGRAMMING PROBLEMS Interim Report
Jacob Moradi and Michael Pappas Mar. 1977 120 p refs
(Contract N00014-75-C-0987)
(AD-A039094; NJIT-NV-12) Avail: NTIS HC A06/MF A01 CSCL 13/13

A fast search algorithm for the solution of nonlinear mathematical programming optimization problems is presented in this report. The procedure combines a boundary tracking (BT) strategy with the feasible direction finding method of zoutendijk. This algorithm was compared with twenty other codes representing most of the popular numerical optimization methods on ten test problems. The new code proved superior to all others in overall generality and efficiency.
GRA

N77-30810# Ohio State Univ., Columbus. Computer and Information Science Research Center.
SOFTWARE REQUIREMENTS FOR SUPPORTING HIERARCHICAL DATABASES
David K. Hsiao, Douglas S. Kerr, and Fred K. NG Apr. 1977 105 p refs
(Contract N00014-75-C-0573)
(AD-A039038; OSU-CISRC-TR-77-1) Avail: NTIS HC A06/MF A01 CSCL 05/2

This report shows the capability of the database computer (DBC) for supporting hierarchical data models and systems. Since IBM's Information Management System (IMS) is the most widely used data management system which supports a hierarchical view of data, we intend to show that the DBC can support IMS databases and IMS application programs. Furthermore, this study provides us with a case for comparing the merits of using a conventional general-purpose computer versus a special-purpose database computer (i.e., the DBC) for data management. It is shown that it is possible to design an interface, known as IMSI between IMS users and the DBC. The IMSI can faithfully execute the DL/1 calls (the data manipulation language of IMS) issued by IMS users. The design of the IMSI is considered in two phases. In the first phase, we show how to represent an IMS database utilizing the built-in (hardware) data structure of the DBC. This representation makes use of the concept of embedding symbolic identifiers into all dependent segments of an IMS database. The use of symbolic identifiers increases the degree of data independence of the stored database. Furthermore, the storage requirement for the symbolic identifiers is substantially offset by the removal of the conventional address pointers currently used in an IMS database.
GRA

N77-30811# Federal COBOL Compiler Testing Service, Washington, D. C.
A PROGRAM FOR SOFTWARE QUALITY CONTROL
Paul Oliver 9 May 1977 7 p refs Presented at Natl. Computer Conf., 1974
(AD-A039679; FCCTS/TR-77/04) Avail: NTIS HC A02/MF A01 CSCL 09/2

Three software tools developed by the Federal COBOL Compiler Testing Service for use in system quality control are described: a COBOL Compiler Validation System being used throughout the Federal Government to determine the degree to which COBOL compilers conform to the COBOL Standard; a system to facilitate the process of COBOL programs conversion; and a set of synthetic programs for system performance measurement.
Author (GRA)

N77-30812# Naval Research Lab., Washington, D. C. Space Systems Div.
SOLRAD-11 ON-LINE SYSTEM (SOLOLS), APPLICATIONS SOFTWARE: INTERIM SYSTEM
Leonard S. Wagner and Donald R. Uffelman Mar. 1977 117 p
(AD-A039604; NRL-MR-3466) Avail: NTIS MF A01 CSCL 09/2

The NRL applications software package in the 'interim' system is a multi-tasking code embodying a single task overlay and is resident on a Data General NOVA 800 minicomputer. The operating tasks are a data display task, QLOOK; a data base write task, UPDTDB; a communications driver task, NLINK2; and a message processing task, PROCT. All tasks other than QLOOK are continuously core resident during operation. QLOOK, because of its size, must be overlayed with only a small root program continuously core resident. QLOOK is the main system task in the sense that it prepared the system to receive the other tasks and then activates them. Once a task is activated, access to the CPU is determined by the RDOS (real-time disk operating system) TASK SCHEDULER according to priority. Since the data display task is of lesser urgency than the real-time data base update, QLOOK lowers its priority after activating the other tasks. The RDOS protocol for task ACTIVATE, ABORT, READY and SUSPEND is designed to make most efficient use of the CPU. Providing adequate access to the CPU for each task is largely a design factor for the code designer.
GRA

N77-30813# Frankford Arsenal, Philadelphia, Pa.
DIGITAL LANGUAGE SYNTAX Final Report
R. L. Gauthier Feb. 1977 81 p
(AD-A039328; FA-FCF-1-77) Avail: NTIS HC A05/MF A01 CSCL 09/2

This report represents a study of digital testing and the integration of digital constructs into Operational Performance Analysis Language (OPAL). Identified are the language elements that must be modified or added to OPAL to incorporate digital

testing. Examples using these constructs are discussed and change sheets for the OPAL specifications are included. GRA

N77-30814*# College of William and Mary, Williamsburg, Va. Dept. of Mathematics and Computer Science.
TIMING FORMULAS FOR DISSECTION ALGORITHMS ON VECTOR COMPUTERS
W. G. Poole, Jr. May 1977 9 p refs
(Contracts NAS1-14101; N00014-75-C-0879; NR Proj. 044-459)
(NASA-CR-153883; AD-A039795; TR-14) Avail: NTIS HC A02/MF A01 CSCL 09/2

The use of the finite element and finite difference methods often leads to the problem of solving large, sparse, positive definite systems of linear equations. Recently the one-way dissection and nested dissection algorithms have been developed for solving such systems. Concurrently, vector computers (computers with hardware instructions that accept vectors as operands) have been developed for large scientific applications. GRA

N77-30815# Yale Univ., New Haven, Conn. Dept. of Computer Science.
ON THE SOLVABILITY OF A WORD PROBLEM FOR RESTRICTED SEMIGROUPS
Lawrence Snyder Jan. 1977 7 p refs
(Contract N00014-75-C-0752)
(AD-A039879; RR-102) Avail: NTIS HC A02/MF A01 CSCL 09/2

A class of semigroups called 1-restricted semigroups is defined in which there is at most one relation per generator and at most one occurrence of the generator symbol in any word equivalent to it. The word problem for 1-restricted semigroups is shown to be decidable. Author (GRA)

N77-30816# Yale Univ., New Haven, Conn. Dept. of Computer Science.
ON THE POWER OF APPLICATIVE LANGUAGES
Richard J. Lipton and Snyder Lawrence Feb. 1975 13 p refs
(Contract N00014-75-C-0752)
(AD-A039873; RR-94) Avail: NTIS HC A02/MF A01 CSCL 09/2

The expressive power of applicative structures is investigated (particularly APL one-liners) with the result that all practically computable functions are one-liner expressible. In particular, the class of functions computable by one-liners contains the elementary functions. The problem of reducing the intermediate storage requirements for evaluating applicative structures is shown to be solvable with only modest execution time degradation. The prospect of improving these results is discussed in connection with an outstanding conjecture concerning a time-space relationship. Author (GRA)

N77-30817# Yale Univ., New Haven, Conn. Dept. of Computer Science.
THE COMPLEXITY OF SEARCHING LINES IN THE PLANE: PRELIMINARY VERSION
Richard J. Lipton and David Dobkin 1975 17 p refs
(Contract N00014-75-C-0752; N00014-75-C-0450)
(AD-A039872; RR-93) Avail: NTIS HC A02/MF A01 CSCL 09/2

Searching is a fundamental operation of computer science. Yet a number of key mathematical questions about searching in Euclidian spaces remains open. A number of such questions are formulated and answered here for searching lines in the plane. Relationships between the results here and higher dimensional analogs for other problems of interest are given. Among the new results is a mathematical framework in which questions about searching can be stated in a more uniform manner than was possible before. Specific results are also given on the searching complexity of various sets of lines in the plane. In particular, it is shown that there are easy and hard sets of lines to search and establish methods of generating upper and lower bounds on the search complexities of such sets. GRA

N77-30818# Yale Univ., New Haven, Conn. Dept. of Computer Science.
INCREASING CONFIDENCE IN SOFTWARE THROUGH PROGRAM PERTURBATIONS
David Hanson, Richard J. Lipton, and Frederick G. Sayward Nov. 1976 20 p refs
(Contract N00014-75-C-0752)
(AD-A039878; RR-100) Avail: NTIS HC A02/MF A01 CSCL 09/2

A new method for increasing confidence in software based on the premise that competent programmers write correct or 'nearly' correct software is presented. The envisioned system takes as input a program and a set of test data. It produces and executes a set of perturbation programs, and generates a list indicating which perturbation programs are indistinguishable from the original program (with the given data). A non-empty list indicates that the data is not adequate, that there exist equivalent programs in the list, or that the original program is incorrect. An empty list indicates that the original program is either correct or 'far' from correct. While the set of perturbation programs should be large enough to include many commonly made errors, it appears that there is a coupling effect suggesting that errors not present in the set of perturbation programs are still checked by this method. Two examples of the use of this method are given. Author (GRA)

N77-30819# Boeing Computer Services, Inc., Seattle, Wash.
BCS SOFTWARE PRODUCTION DATA Final Technical Report, Feb. 1976 - Feb. 1977
Rachael K. Black, Robert Katz, Malcolm D. Gray, and Richard F. Curnow Griffiss AFB, N. Y. RADC Mar. 1977 197 p
(Contract F30602-76-C-0174)
(AD-A039852; BCS-40151; RADC-TR-77-116) Avail: NTIS HC A09/MF A01 CSCL 09/2

This report contains the results of work accomplished by Boeing Computer Services for AF RADC. The purpose of this study was to assess the impact of modern software development techniques on the cost of developing computer software. The five in-house projects selected for study varied in size, type of application, and computing environment. The collection of practices found to have the most beneficial impact on software development are, in order of their impact: Project Organization and Management Procedures, Testing Methodology, Configuration Management and Change Control, and Design Methodology. Existing military standards and specifications are sufficiently comprehensive to encourage the use of beneficial practices; however, certain standards and specifications may require modification to make their applicability to software procurements more pertinent. Author (GRA)

N77-30820# North Carolina State Univ., Raleigh. Dept. of Electrical Engineering.
STUDIES IN IMAGE ANALYSIS: USING ENCODED STEREO IMAGES FOR SCENE ANALYSIS Final Report, Jan. 1976 - Jan. 1977
J. N. England and W. E. Snyder Jan. 1977 9 p refs
(Grant DAAG29-76-G-0133)
(AD-A040235; ARO-13989.3-EL) Avail: NTIS HC A02/MF A01 CSCL 12/1

The possibility of using image coding techniques to facilitate stereoscopic depth determination for scene analysis has been investigated over the past year. A promising technique, run length coding, was applied to scene analysis. A method of encoding which helps ensure regional coherency is described. In addition, work to enable operations such as feature extraction and feature correlation in a run length coded data structure is described as is the use of these operations in determining depth information from two views of a scene. Author (GRA)

N77-30821# Goodyear Aerospace Corp., Akron, Ohio.
SPECIFICATION FOR A STARAN PROGRAMMING LANGUAGE Final Technical Report, 8 Mar. - 8 Oct. 1976
R. G. Lange, H. Chesseman, E. W. Davis, and R. W. Lott Griffiss AFB, N. Y. RADC Apr. 1977 186 p
(Contract F30602-76-C-0200)
(AD-A040468; GER-16347; RADC-TR-77-131) Avail: NTIS HC A09/MF A01 CSCL 09/2

This specification defines a procedure-oriented language with emphasis on parallel arithmetic and associative processing features. The meanings of the more common operations on scalars are promoted to multiple element data organizations. Data types and structures are provided to support these operations,

and the structured design and programming disciplines. The language is designed to be useful with the Goodyear Aerospace Corporation STARAN computer system. However, no feature of the language is strictly dependent on the STARAN architecture for proper execution. Author (GRA)

N77-30822# National Physical Lab., Teddington (England). Div. of Numerical Analysis and Computing.
SOME AIDS FOR PROGRAM DOCUMENTATION
R. S. Scowen Mar. 1977 22 p refs
(NPL-NAC-76) Avail: NTIS HC A02/MF A01

The documentation of computer programs can be considerably eased and standardized using the programs described. They are basically machine and language independent, possess a simple structure, use one serial input and one output stream, and require no backing store. The programs are: (1) INDEX (gives an index of all identifiers used in a program), (2) POLISH (paginates a program listing so that the global structure is evident), (3) UNDOC (creates a live program from its documented form), (4) WATER (helps find misprints in computer readable reports). Also included are examples of the output from these programs. Author (ESA)

N77-30823# Northwestern Univ., Evanston, Ill. Center for Mathematic Studies in Economics and Management Science.
GEOMETRIC DUALITY VIA ROCKAFELLAR DUALITY
Elmor L. Peterson Jan. 1977 19 p
(Grant AF-AFOSR-3134-77)
(AD-A039581; Discussion Paper-270; AFOSR-77-0566TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

A specialization of Rockafellar duality to (generalized) geometric duality provides an efficient mechanism for extending to the latter theory previously developed for the former.
Author (GRA)

N77-30824# North Carolina Univ., Chapel Hill.
VARIANCE REDUCTION TECHNIQUES FOR NONSTATIONARY SIMULATION MODELS
George S. Fishman Feb. 1977 25 p
(Contract N00014-76-C-0302)
(AD-A036687; TR-77-3) Avail: NTIS HC A02/MF A01 CSCL 12/2

Most variance reduction techniques encountered in simulations are designed to operate with stationary models. However, many simulations are nonstationary in character, population growth models being an example. One way to facilitate statistical inference in a nonstationary simulation is to interchange the order of replication collection and time evolution. That is, at each point several replications are performed to enable a user to estimate parameters at that point in time. This paper describes three variance reduction techniques that use this interchange between collection and evolution to induce negative correlation between replications, thereby producing estimates with smaller variances. Model 1 describes a procedure that occassionally relies on the solution of a linear program to develop an optimal sampling plan. Model 2 offers an alternative that applies when the populations in strata are large. Model 3 applies when survival probabilities are functions of an exogenous random variable such as rainfall. A female elephant population simulation illustrates the success one can expect with model 1. GRA

N77-30825# Defense Documentation Center, Alexandria, Va.
FORTRAN 4 PROGRAMMING LANGUAGE Report Bibliography, Jun. 1968 - Sep. 1976
Feb. 1977 364 p refs
(AD-A036500; DDC/BIB-77/02) Avail: NTIS HC A16/MF A01 CSCL 09/2

This bibliography contains selected unclassified and unlimited citations on FORTRAN 4 Programming Language. These citations are studies and analyses pertaining to performance effectiveness, capability, evaluation, and reliability test. Indexes of Corporate Author-Monitoring Agency, subject, title and personal author are included. GRA

62 COMPUTER SYSTEMS

Includes computer networks.

N77-30826 Syracuse Univ., N. Y.
SOME CHARACTERISTICS OF PARALLEL SORTING NETWORKS Ph.D. Thesis
Chung Chang Lee 1976 121 p
Avail: Univ. Microfilms Order No. 77-9873

The characteristics of multitonic sequences applied to parallel sorting networks are studied. A sorting network depends on various sorting algorithms and basic comparison element (BCE) implementation. A BCE is a device which can compare inputs and yields ordered outputs either in ascending order or in descending order. Sorting algorithms for parallel processing are described. The determination of sorting algorithms for parallel processing is based upon two important factors: (1) the number of BCE's used, and (2) the number of comparison levels (or delays) required in the network. A technique of graphic method is introduced, which helps the analysis of characteristics of multitonic sequences with respect to 2-sorters, and leads to the construction of perfect shuffle networks with 0 and 1 operations. The technique of graphic method applied to construct perfect shuffle networks with BCE's that can accept three inputs.
Dissert. Abstr.

N77-30827 Northwestern Univ., Evanston, Ill.
THE ARCHITECTURE OF A FUNCTIONALLY DISTRIBUTED COMPUTER SYSTEM Ph.D. Thesis
Alfons Reszka 1976 164 p
Avail: Univ. Microfilms Order No. 77-10082

A deliberate and structured approach to the organization of a computer system to meet specified functional objectives was investigated. The flow of information in the system and the partitioning or decomposition of the system into subsystems or nodes, which provide simple information flow structure and high functional system performance, were considered. Dissert. Abstr.

N77-30828 Pennsylvania Univ., Philadelphia.
AN EXTENDABLE INTERACTIVE COMPUTATION SYSTEM WITH AUTOMATIC UNIT ANALYSIS AND CORRECTION Ph.D. Thesis
Randall Paul Shumaker 1976 248 p
Avail: Univ. Microfilms Order No. 77-10217

A complete language for a specific interactive computation aid was designed and implemented using general-purpose software. This language has a number of features which are intended to facilitate the incremental solution of mathematical problems. It also serves as a design example for implementators who wish to use the methodology developed. An unusual feature of this particular computation system is the inclusion of automatic unit analysis and conversion. This feature is intended to aid the problem-solver in the detection of errors as well as providing for automatic unit conversion where that is appropriate. A data structure and general purpose algorithms for unit processing were designed and implemented. The techniques employed greatly reduce search time and storage space required for conversion factors, and have the additional advantage of being entirely arithmetic in nature. Dissert. Abstr.

N77-30829 Cornell Univ., Ithaca, N.Y.
NONLINEAR CIRCUIT SIMULATION ON A PARALLEL MICROCOMPUTER SYSTEM Ph.D. Thesis
Yue Min Wong 1976 142 p
Avail: Univ. Microfilms Order No. 77-11030

A scheme for connecting many microcomputer systems in parallel to find the transient solution to large nonlinear networks is presented. Parallelism is accomplished by a simple technique where each microcomputer is connected through an input-output port to a single common bus. Both hardware realization and algorithmic considerations are described. A preprocessing phase is required to build the required data structures and determine the partition and pivot order. This preprocessing step may be done on a separate serial computer. Examples are given to illustrate the process. As an example of a possible realization, an interface design is presented for connecting the Digital Equipment Corporation LSI-11 microcomputer to a common bus.
Dissert. Abstr.

N77-30830 Cornell Univ., Ithaca, N.Y.
CONSTANT DELAY VERSUS AMPLITUDE SELECTIVITY FOR MINIMUM PHASE LOSSLESS LUMPED NETWORKS AND

TRANSMISSION LINE STRUCTURES Ph.D. Thesis
Jean-Lien-Chen Wu 1976 141 p
Avail: Univ. Microfilms Order No. 77-11031

Minimum phase lossless transfer functions which simultaneously possess linear phase in the pass band and steep amplitude selectivity characteristics are constructed. The basic constraints on the linear phase and amplitude selectivity for a doubly-terminated lossless minimum phase 2-port transducer are determined. The method presented begins with the specification of linear phase characteristic in the pass band and monotonic roll-off characteristic in the stop band followed by a determination of the rest of the two characteristics by Hilbert transform relationships. It is shown that in minimum phase transducers the bandwidth for linear phase is strictly constrained independent of the complexity of the transducer once the amplitude selectivity is prescribed. The effect of introducing nonlinear phase distortion in the pass band on the linear phase bandwidth versus amplitude selectivity is discussed. Dissert. Abstr.

N77-30831 Syracuse Univ., N. Y.
ACTIVITY ANALYSIS OF LINEARLY RESTRICTED OPERATING SYSTEMS Ph.D. Thesis
Chao Peng Hsieh 1976 162 p
Avail: Univ. Microfilms Order No. 77-9862

An operating system of total computing utility is described. The system is defined as a collection of different resource types serving diversified user demands. Resource allocation is formulated as a liner programming problem with constraints on resources and optimization. A dynamic problem is studied through memory utilization with a warehousing model, and user program characteristics under page-on-demand environment are examined. An analytic representation of the property and its implication on memory allocation is suggested. B.B.

N77-30832# *Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
A GENERAL COMPUTER NETWORK SIMULATION MODEL M.S. Thesis
Hoyt M. Warren, Jr. Mar. 1977 325 p refs
(AD-A039772; AFIT/GCS/EE/77-3) Avail: NTIS HC A14/MF A01 CSCL 09/2

The emphasis of this investigation is on the development of a general computer network simulation model for the evaluation of alternative computer network configurations. The simulation model allows a computer network and its workload to be characterized and then allows selected performance measures to be made. The various phases of the development process are discussed. In the initial phase, symbolic system modeling and simulation techniques are surveyed. This discussion dwells heavily upon discrete-event modeling and simulation techniques. Next, the component architectures and essential performance measures of computer networks are investigated. Then, a computer network model is presented. The features of the network model are discussed and a description of job flow is given. This discussion describes the characterization and interrelationships of the various model variables and the algorithms governing their behavior. GRA

63 CYBERNETICS

Includes feedback and control theory.
For related information see also *54 Man/System Technology and Life Support.*

N77-30833 Michigan Univ., Ann Arbor.
ANALYSIS AND SIMPLIFICATIONS OF DISCRETE EVENT SYSTEMS AND JACKSON QUEUEING NETWORKS Ph.D. Thesis
Benjamin Melamed 1976 327 p
Avail: Univ. Microfilms Order No. 77-7991

Deterministic discrete event systems are modeled by formal automata-like structures, and a hierarchy of morphic relations among them is developed. A canonical representation of stochastic discrete event systems in coordinate probability space is proposed, and a hierarchy of morphic relations among them is constructed by means of measure preserving transformations. A general conceptual framework for simplications is proposed, and the morphisms are shown to fall within its scope. Several operating characteristics of the class of Jackson queueing networks are investigated. Special emphasis is placed on rigorous derivations of results from solid mathematical and statistical foundations. A number of theoretical gaps in the extant theory of state equilibrium are closed, and Burke's Theorem is extended from M/M/1 queues to Jackson networks with single server nodes. Dissert. Abstr.

N77-30834 Kansas Univ., Lawrence.
MITHRA SPECIFICATIONS: A UNIFIED APPROACH TO IMAGE PROCESSING HARDWARE Ph.D. Thesis
Philip Lee Currier 1976 238 p
Avail: Univ. Microfilms Order No. 77-2206

Specifications are generated for the MITHRA (Multi-Input, Tri-Dimensional Hybrid, Random Access Processor) image interpretation system which incorporates in a single station coherent optical processing, analog electronic processing, and digital electronic processing capabilities. Emphasis is placed in this system concept, upon the dominant role of the human photointerpreter as he interacts with the equipment at his disposal to facilitate speed and accuracy requirements. Radar simulations and conventional image analysis are highly interrelated in the MITHRA concept. A radar image simulation project utilizing the University of Kansas' IDECS (Image Discrimination, Enchancement, Combination and Sampling) image processing equipment is presented. The hardware specifications for the MITHRA interpreter station are defined based upon some of the simulation techniques demonstrated in this simulation project.
Dissert. Abstr.

N77-30835 Southern Methodist Univ., Dallas, Tex.
AUTOMATING THE DESIGN OF DEDICATED REAL TIME CONTROL SYSTEMS Ph.D. Thesis
Mathew Nicholas Matelan 1976 261 p
Avail: Univ. Microfilms Order No. 77-9789

A methodology for reducing the complexity of designing dedicated real time control systems is developed. The concept of hardware binding is introduced, and it is shown that delaying the point in the design cycle when hardware is functionally bound allows a new approach to machine independence. Concepts which allow expression of repetitive control situations are described, and a realization-independent language (CSDL), based on these concepts, is defined. Methods for automatically selecting a time-wise correct monitor are classified, and techniques for specifying the realization capabilities of digital processors are discussed. The CSD model provides a structured description of the control system design process, allowing a unified perspective in the realization of controllers for applications previously considered to be unrelated. The concepts developed, both in the model and in the system, define a new direction in the production of real time control systems. Dissert. Abstr.

N77-30836# Harvard Univ., Cambridge, Mass. Div. of Engineering and Applied Physics.
SYSTEM CYCLING FOR PARAMETERS ESTIMATION: OPTIMAL INPUT AND MEASUREMENT SCHEDULES DESIGNS
Sergio Bittanti Scida Jan. 1977 38 p refs
(Contract N00014-75-C-0648; Grant NSF GK-31511; NR Proj. 372-012)
(AD-A039388; TR-666) Avail: NTIS HC A03/MF A01 CSCL 09/4

This paper deals with the parameters estimation of discrete-time and time-invariant system, affected by additive output noise, under periodic operation. Assuming a norm of the Fisher Information Matrix as performance index, the problems of the optimal periodic input design, of the joint optimal periodic input and measurement schedules design and of the choice of the best period for parameters estimation are formally stated. Through the introduction of the average per sample Fisher Information Matrix, they are recognized as Periodic Optimal Control problems. A closed form solution is found in the particular case of linear systems with a scalar unknown parameter. Author (GRA)

N77-30837# Yale Univ., New Haven, Conn. Dept. of Computer Science.
ON AN ARRAY SORTING PROBLEM OF KOSARAJU

Richard J. Lipton, Raymond E. Miller, and Lawrence Snyder Feb. 1977 8 p refs
(Contract N00014-75-C-0752)
(AD-A039874; RR-75) Avail: NTIS HC A02/MF A01 CSCL 12/2

An array sorting problem is shown to have a linear lower time bound for n-x-n arrays. This negatively settles a conjecture of Kosaraju. Several other sorting schemes are considered, but all fail to improve performance. The impossibility of better than linear time sorting bounds for arrays with local rules is conjectured. GRA

N77-30838# Research Center, Graz (Austria).
OPTIMAL CONTROL PROBLEMS FOR INTEGRODIFFERENTIAL EQUATIONS OF VOLTERRA TYPE Final Technical Report, Jan. 1976 - Jan. 1977
F. Kappel and H. Stettner Dec. 1976 100 p refs
(Grant DA-ERO-76-G-024)
(AD-A040163) Avail: NTIS HC A05/MF A01 CSCL 12/1

In this paper the optimal control problem for integrodifferential equations of Volterra type are investigated where the targets sets are elements of some function space. The approach used is the abstract theory of Dubovitskii and Milyutin, the result is a necessary condition in form of a maximum principle. GRA

N77-30839# Loughborough Univ. of Technology (England). Dept. of Mathematics.
IN THE CONTROLLABILITY OF LINEAR CONSTANT DELAY-DIFFERENTIAL SYSTEMS
M. Frost (Trent Polytech., Nottingham, Engl.) Apr. 1976 23 p refs
(MATHS-Res-97) Avail: NTIS HC A02/MF A01

The possibility of extending some well known results in the theory of linear constant ordinary differential systems to the theory of delay-differential systems was examined with particular reference to the R(n)-controllability of the latter type of systems. Other definitions of controllability for delay-differential systems are also considered and their connections with R(n)-controllability discussed. Author (ESA)

N77-30840# Loughborough Univ. of Technology (England). Dept. of Mathematics.
THE DOMAIN OF NULL-CONTROLLABILITY FOR CERTAIN NON-LINEAR SYSTEMS
J. Kyle Oct. 1976 14 p refs Presented at the Conf. on Recent Theoret. Develop. in Control, Leicester, Engl., Sep. 1976
(MATHS-Res-104) Avail: NTIS HC A02/MF A01

The domain of null controllability for the second order scalar equation X' = f(x, x', u) is described in which the control function u belongs to the set of measurable functions taking values in some closed bounded set OMEGA of the real time, concentrating on the case when f is independent of x or x'. The domain of null controllability means the set of all initial points (x, y) - where y = x' - which can be steered to the origin by some admissible control in some finite time duration. ESA

N77-30841# Rosenstiel School of Marine and Atmospheric Sciences, Miami, Fla.
CLASSIFICATION OF OILS BY THE APPLICATION OF PATTERN RECOGNITION TECHNIQUES TO INFRARED SPECTRA Final Report
James S. Mattson Mar. 1976 49 p refs
(Contract DOT-CG-81-75-1364)
(AD-A039387; USCG-D-6-77) Avail: NTIS HC A03/MF A01 CSCL 11/8

The classification of multicomponent petroleum oils (crude oils, lubricants, distillate and residual fuels) solely by their infrared absorption spectra is a difficult task. Crude oils alone include a phenomenal variety of systems, from heavy asphaltic crudes to light crudes that are similar to a No. 2 fuel oil. Furthermore, the distinctions between classes of fuel oils (i.e., Nos. 1, 2, 4, 5 and 6 fuels) are based upon ASTM specifications for continuous properties such as flash point and viscosity. In South Florida, for example, local fuel oil suppliers meet requests for Nos. 4 or 5 fuel oils by blending together appropriate proportions of Nos. 2 and 6 fuels. In order to reduce the amount of sampling required in the event of an oil pollution incident, it would be useful to be able to initially classify the pollution sample into one of the above groups. Infrared spectroscopy has been promoted as a useful analytical technique for oil classification and identifications, since it does provide some information on the aliphatic, aromatic, polynuclear aromatic, carbonyl, and organosulfur composition of an oil. Infrared spectra have been used in previous efforts to distinguish asphalts from residual fuels, and to provide a tool for 'fingerprinting' oils. Kawahara et al. applied linear discriminant function analysis (LDFA) to their infrared data to make the binary distinction between asphalts and residual fuels. Author (GRA)

64 NUMERICAL ANALYSIS

Includes iteration, difference equations, and numerical approximation.

N77-30842 Alabama Univ., Birmingham.
EVALUATION OF SWITCHING ALGORITHMS AS PART OF A MODULARIZED COMPUTER PACKAGE FOR NONLINEAR OPTIMIZATION Ph.D. Thesis
Jane Elizabeth Brownlee Hazelrig 1976 120 p
Avail: Univ. Microfilms Order No. 77-6823

An experiment in which several dependent variables are measured was performed and a theoretical model involving unknown parameters is hypothesized to relate the observations to the theoretical response. A modularized computer program was written for handling nonlinear optimization problems in which the parameters may be subject to constraints. A method which dictates switching between high and low overhead algorithms according to the local geometry of the parameter space was studied. To implement the strategy algorithmically, quatitative criteria were defined for determining in which local regions of the paramenter space the quadratic approximations dictated by the Gill-Murray gradient quasi-Newton algorithm were worth computing. Dissert. Abstr.

N77-30843 Wisconsin Univ., Milwaukee.
SINGULAR PERTURBATIONS OF BOUNDARY VALUE PROBLEMS WITH APPLICATIONS TO TURNING POINT PROBLEMS Ph.D. Thesis
Gilbert Newton Lewis 1976 87 p
Avail: Univ. Microfilms Order No. 77-7637

Linear boundary value problems of a particular form are discussed. In a given case the method of matched asymptotic expansions is explained, and an asymptotic expansion of the solution is found and proved to be a uniformly valid approximation at some interval. In the case of the classical turning point problem, the previously explained matching procedure does not always yield reliable results. This condition is explained. Dissert. Abstr.

N77-30844 Louisiana Tech Univ., Ruston.
EXISTENCE AND UNIQUENESS OF SOLUTIONS TO CERTAIN THIRD ORDER BOUNDARY VALUE PROBLEMS Ph.D. Thesis
Varahur Ramachandra Guru Moorti 1976 74 p
Avail: Univ. Microfilms Order No. 77-7808

Conditions are established for the existence and uniqueness of solutions for certain third order boundary value problems and for some generalizations of them to n-th order differential equations. Green's functions are derived for ten distinct problems determined by particular conditions. Utilizing these functions in a contraction mapping, interval length estimates for the existence of unique solutions are obtained for some of these boundary value problems by assuming a Lipschitz condition. In cases where Green's functions are computationally difficult, a contraction mapping is used that does not require Green's functions. The results of such a mapping are clearly weaker than those arrived at through the use of Green's functions. In another approach, a solution-matching technique is used to obtain conditions under which unique solutions exist for certain n-th order boundary value problems with boundary conditions specified at alpha, beta and theta. These results, for the case n = 3, are compared with corresponding results derived by the use of Green's functions. It is shown that the two approaches used in this work supplement each other, since one method cannot be considered better than the other. Dissert. Abstr.

N77-30845 Pennsylvania State Univ., University Park.
TRIE STRUCTURED INDEX MINIMIZATION Ph.D. Thesis
Douglas Earl Comer 1976 172 p
Avail: Univ. Microfilms Order No. 77-9763

A graph model is presented of a trie, and several problems related to the complexity of trie minimization are considered. The space complexity and access time complexity are considered. Although the model is based on the tabular implementation, the space complexity results extend to the linked-list implementation. It is shown that determining minimal size tries is an NP-complete problem for several variants of tries. For tries in which leaf chains are deleted it is that determining a trie with minimum average access time is also an NP-complete problem. The problem of determining a trie for which the worst case access time is minimum is also shown to be NP-complete. This problem is equivalent to the problem of removing the greatest number of redundant attributes from the file. The results are strong in that they hold for files in which the attributes are chosen from a binary or ternary alphabet. Heuristics are considered for approximating minimum space tries. In an attempt to be more realistic, heuristics are considered only for a class of restricted files containing no trivial or isomorphic attributes. Dissert. Abstr.

N77-30846 Iowa State Univ. of Science and Technology, Ames.
GENERALIZED CONVEX PROGRAMMING OVER CONE DOMAINS Ph.D. Thesis
Clarence Dean Alders 1976 138 p
Avail: Univ. Microfilms Order No. 77-10296

The well-known necessary and sufficient optimality conditions of convex programming is extended to optimization problems with generalized convex functions. In particular, this extension includes programming problems with functions which can be classified as quasiconvex or pseudoconvex. Hence, one aspect of the study is to establish useful sufficient conditions which can be used to identify these generalized convex functions. A further consequence is to extend the classical Kuhn-Tucker and Fritz John necessary and sufficient conditions of nonlinear programming to a broader class of problems; in particular, to nonlinear programming problems over arbitrary cone domains. Some of the main results are summarized. Dissert. Abstr.

N77-30847 Maryland Univ., College Park.
CONTINUOUS PARAMETER MARKOV CHAINS, CLASSIFICATION OF BOUNDARY POINTS AND USE OF LOCAL TIME Ph.D. Thesis
Harry Frederick Bushar 1976 140 p
Avail: Univ. Microfilms Order No. 77-9492

Continuous time parameter Markov chains with discrete state spaces are investigated, especially for the case in which the minimal solution of the Kolmogorov backward equation is sub-stochastic. For this case, the discrete state space must be compactified through the addition of an appropriate boundary. The first problem is to extend the strong Markov property to the boundary. The next problem is the construction problem of finding all stochastic solutions to the Kolmogorov backward equation, solely in terms of the minimal solution. The final problem is to classify the boundary points, in such a way that the behavior of the sample paths of the Markov chain, as it first approaches and then leaves each boundary point, can be completely described. The first procedure used is to thoroughly examine the various compactifications of the discrete state space which have been used to provide appropriate boundaries. Next, exit and entrance laws are constructed to describe the passage of the Markov chain to and from the boundary. Finally, the concept of local time is employed, both to simplify the construction problem and to characterize the boundary points. Dissert. Abstr.

N77-30848 Pennsylvania Univ., Philadelphia.
ITERATIVE THREE-DIMENSIONAL IMAGE RECONSTRUCTION FROM PROJECTIONS: APPLICATIONS IN ELECTRON MICROSCOPY Ph.D. Thesis
James George Colsher 1976 271 p
Avail: Univ. Microfilms Order No. 77-10151

The reconstruction of three dimensional objects from their two dimensional projections was investigated. The approach used was that of progressing systematically from computer generated synthetic images, through simple test objects, to the more complicated problem of asymmetrical biological particles as imaged by the electron microscope. Various mathematical techniques whereby the object can be determined from sets of projections at different orientations were considered. Dissert. Abstr.

N77-30849# Rockwell International Corp., Anaheim, Calif. Electronics Device Div.
ON THE STABILITY OF HOMOGENEOUS RECURSIVE DIFFERENCE EQUATIONS WITH VARIABLE COEFFICIENTS
Loren R. McMurray 6 Jun. 1977 16 p refs Presented at the SIAM 1975 Natl. and 25th Anniv. Meeting, Philadelphia, 13-15 Jun. 1977
(X77-548/501) Avail: NTIS HC A02/MF A01

Stability of a homogeneous, recursive difference equation with variable coefficients is investigated for two cases. In case 1, the value of each b sub m (n) is arbitrary. In case 2, the b's are updated by a nonlinear equation corresponding to a gradient search. Constraints sufficient for convergence of y (n) to zero and for boundness of y (n) are developed for both cases. For a certain situation, the case 1 stability constraints are necessary as well as sufficient. The presented stability constraints are simple functions of the b-coefficients and Mu and do not require solving for eigenvalues nor finding Lyapunov functions. This enhances evaluation of the stability constraints when applied to a particular homogeneous recursive equation. Author

N77-30850# California Univ., Berkeley. Electronic Research Lab.
ROUNDOFF ERROR IN THE SOLUTION OF FINITE ELEMENT SYSTEMS
Beresford Parlett 22 Jun. 1976 22 p refs Presented at the US-Germany Symp. on Formulations and Computational Algorithms in Finite Elem. Analyses, Cambridge, Mass., Aug. 1976
(Contract N00014-76-C-0013)
(AD-A039309; ERL-M593) Avail: NTIS HC A02/MF A01 CSCL 12/1

The paper considers the effect of roundoff error in the solution process of equilibrium finite element method equations. The use of the equivalent perturbation matrix, the misuse of scaling, and the estimation of the condition number are discussed. Author (GRA)

N77-30851# Air Force Flight Dynamics Lab., Wright-Patterson AFB, Ohio.
SOLVING THE REAL GENERALIZED SYMMETRIC EIGENPROBLEM BY SIMULTANEOUS INTERATION Interim Report, 1 Oct. 1972 - 31 Jul. 1976
Paul J. Nikolai Dec. 1976 35 p refs
(AD-A039226; AFFDL-TR-76-118) Avail: NTIS HC A03/MF A01 CSCL 12/1

This report provides a USA Standard FORTRAN implementation of the simultaneous iteration algorithm for partial solution of the eigenvalue problem for a real matrix symmetric relative to a prescribed inner product. Also included is a brief discussion of the operation of the algorithm together with the solution of a sample problem executed using FORTRAN Extended, Version 4, under the NOS/BE operating system for the CDC 6600. GRA

N77-30852# Colorado State Univ., Fort Collins. Dept. of Electrical Engineering.
STATISTICAL DESIGN OF AUTOREGRESSIVE-MOVING AVERAGE DIGITAL FILTERS
Louis L. Scharf and James C. Luby Apr. 1977 43 p refs
(Contract N00014-75-C-0518)
(AD-A039970; TR-21(ONR)) Avail: NTIS HC A03/MF A01 CSCL 12/1

Procedures are presented for the systematic design of digital filters that contain poles and zeros. The procedures are simple, fast, and effective. All of the important algorithms are of the Levinson-type. The first key idea in the paper is that one may begin a design by posing a linear prediction problem for a stochastic sequence. The second is that a high-order 'whitening' filter may be constructed for this sequence and 'inverted' to yield a high-order all-pole filter whose spectrum approximates the spectrum of the stochastic sequence. The third key idea is that the all-pole filter may be used to generate consistent unit pulse and convariance sequences for use in the Mullis-Roberts

algorithm. This algorithm is then used to obtain a low-order digital filter with poles and zeros that approximates the high-order all-pole filter. The results demonstrate that the Mullis-Roberts algorithm, together with the design philosophy of this paper, may be used with profit to reduce filter complexity and to design spectrum-matching digital filters. Author (GRA)

N77-30853# Florida State Univ., Tallahassee. Dept. of Statistics.
CORRELATION IN POLYNOMIAL REGRESSION
Ralph A. Bradley and Sushil S. Srivastava Mar. 1977 8 p refs
(Contract N00014-76-C-0394)
(AD-A039547; FSU-Statistics-M409; TR-111-ONR) Avail: NTIS HC A02/MF A01 CSCL 12/1

It has been stated that centering of the independent variable in quadratic regression reduces the correlation between linear and quadratic terms. This in turn reduces or removes ill conditioning of the matrix to be fitted in the use of least squares. It is shown in this paper how the correlation between linear and quadratic terms depends on c, the departure from centering of the independent variable in terms of a measure of variation in the variable. It is shown that the correlation approaches unity in absolute value as the absolute value of c approaches infinity and that it is near unity in absolute value for even modest values of the absolute value of c. It is shown further that with appropriate centering, the correlation may be reduced to zero. The results developed for simple quadratic regression extend easily to polynomial regression with similar effects.
Author (GRA)

N77-30854# Naval Ship Research and Development Center, Bethesda, Md. Computation Mathematics/Logistics Dept.
NUMESH: A COMPUTER PROGRAM TO GENERATE FINITE-DIFFERENCE MESHES FOR ARBITRARY DOUBLY-CONNECTED TWO-DIMENSIONAL REGIONS Final Report
Roderick M. Coleman Mar. 1977 39 p
(SR0140201)
(AD-A039538; CMLD-77-05) Avail: NTIS HC A03/MF A01 CSCL 12/1

NUMESH is a computer program for the numerical generation of boundary-fitted coordinate systems for two-dimensional regions. A numerical transformation maps a doubly-connected region bounded by arbitrary curves onto a rectangular computational field with a square mesh. Numerical solutions of partial differential equations may be obtained from the computational field without interpolation regardless of boundary shape. The mathematical procedure and the use of the program are described. Two types of meshes can be produced which are useful for solving problems such as flow past a submerged body in a channel or under a free surface. The use of interactive graphics permits a mesh to be generated, viewed, and regenerated with slight alterations, until a suitable mesh definition is obtained. Meshes are shown for several configurations involving circular and arbitrarily-shaped bodies. Author (GRA)

N77-30855# Naval Underwater Systems Center, New London, Conn.
A TECHNIQUE FOR COHERENT DETECTION AND RELATING OF SPECTRAL SIGNALS
Norman L. Owsley 7 Apr. 1977 36 p refs
(SF11121110)
(AD-A039471; NUSC-TR-5495) Avail: NTIS HC A03/MF A01 CSCL 12/1

An important class of spectral signals is that for which the components within a signal set are characterized by complex emvelopes which exhibit correlation. A technique is proposed for extraction of such a signal set based on an orthogonal decomposition of the cross (discrete) frequency correlation matrix describing the set in the presence of additive uncorrelated noise. Certain advantages of the technique relative to those based of Fourier analysis with either smoothed estimated power spectrum or minimum variance processing are presented. Specifically, it is illustrated how the detection performance of the technique is established by the total energy in the spectral set rather than by the levels of individual spectral elements in the set. Furthermore, it is shown how minimum variance spectrum analysis actually can suppress components in such a set. Finally, simulated examples are presented which illustrate the performance of the technique. Author (GRA)

N77-30856# Orincon Corp., La Jolla, Calif.
DESIGN OF PRACTICAL CONTROL ALGORITHMS FOR NONLINEAR STOCHASTIC SYSTEMS Technical Report, 1 Feb. 1976 - 31 Jan. 1977
Daniel L. Alspach 30 Mar. 1977 11 p refs
(Contract F44620-75-C-0023)
(AD-A039191; OC-R-77-0023-1; AFOSR-77-0501TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

The method of aligning the dual goals of the general optimal stochastic control as a design tool is discussed. When the two goals are exactly aligned, the certainty equivalence control is optimal and no additional intentional probing is required. If these goals are anti-aligned, demanding opposing controls, the certainty equivalence control can be, locally at least, the worst control possible. The case of a nonlinear filter in a feedback loop with dual goals aligned is shown to have performance very close to that of an optimal stochastic control. A new nonlinear filter was developed for the adaptive Kalman filtering problem where only the measurement noise is unknown. Author (GRA)

N77-30857# University Coll., Cork (Ireland). Dept. of Mathematical Physics.
FUNDAMENTALS OF THE EDGE-FUNCTION METHOD VIA LAPLACE'S EQUATION Scientific Interim Report, 1 Jul. 1975 - 30 Jun. 1976
Patrick M. Quinlan 1 Feb. 1977 88 p refs
(Grant AF-AFOSR-2786-75; AF Proj. 9767)
(AD-A039394; EOARD-TR-77-01) Avail: NTIS HC A05/MF A01 CSCL 12/1

The main algebraic and programming features of the Edge-Function Method are illustrated by application to Laplace's equation for polygonal regions with elliptical cavities. The basic functions, vertex, edge and mapped polars, are obtained. Vertex Functions, Harmonic Fitting and submission into elements are covered. Programs are attached. Author (GRA)

N77-30858# Yale Univ., New Haven, Conn. Dept. of Computer Science.
ON STRUCTURE PRESERVING REDUCTIONS
Richard J. Lipton and Nancy Lynch Dec. 1976 19 p refs
(Contract N00014-75-C-0752; Grant NSF DCR-92373)
(AD-A039574; RR-85) Avail: NTIS HC A02/MF A01 CSCL 12/1

The concept of reduction between problems is strengthened. Certain standard problems are shown to be complete in the new and stronger sense. Applications to the number of solutions of particular problems are presented. Author (GRA)

N77-30859# Yale Univ., New Haven, Conn. Dept. of Computer Science.
ON THE HALTING OF TREE REPLACEMENT SYSTEMS
Richard J. Lipton and Lawrence Snyder Mar. 1977 11 p refs
(Contract N00014-75-C-0752)
(AD-A039877; RR-77) Avail: NTIS HC A02/MF A01 CSCL 12/1

A meta theorem is proved giving sufficient conditions for termination of tree replacement systems. This leads to a new proof methodology for proving termination of optimization techniques. Author (GRA)

N77-30860# Yale Univ., New Haven, Conn. Dept. of Computer Science.
TALK NOTES ON MATHEMATICAL STUDIES OF PARALLEL COMPUTATION
Raymond E. Miller Oct. 1976 203 p refs
(Contract N00014-75-C-0752)
(AD-A039472; RR-89) Avail: NTIS HC A10/MF A01 CSCL 12/1

An overview of recent research in the mathematical properties of parallel computation. Author (GRA)

N77-30861# Yale Univ., New Haven, Conn. Dept. of Computer Science.
A CONSTRUCTIVE GENERALIZATION OF THE BOREL-

CANTELLI LEMMA WITH APPLICATION TO THE COMPLEXITY OF INFINITE STRINGS

Richard A. DeMillo (Wisconsin Univ., Milwaukee) and Richard J. Lipton Dec. 1975 18 p refs
(Contract N00014-75-C-0752)
(AD-A039869; RR-59) Avail: NTIS HC A02/MF A01 CSCL 12/1

A constructive adaptation of the Borel-Cantelli Lemma is obtained. Applications to several problems of complexity include the existence of hard 0,1 polynomials. Author (GRA)

N77-30862# Naval Underwater Systems Center, New London, Conn.

CONSTANT-Q SPECIAL ANALYSIS BY MEANS OF AN APPROXIMATE FAST FOURIER TRANSFORM TECHNIQUE

William F. Michael, Jr. 4 Jul. 1977 47 p refs
(AD-A040813; NUSC-TR-5585) Avail: NTIS HC A03/MF A01 CSCL 12/1

A technique for achieving constant-Q spectral analysis by means of an approximate fast Fourier transform (FFT) is presented. Some underlying theory of the approximate FFT and of constant-Q spectral analysis is given. The benefits and drawbacks of this technique are presented. Initial outputs of the technique from a FORTRAN-based Univac 1108 program show that this technique for constant-Q spectral analysis works, and they also illustrate some of the basic characteristics of constant-Q spectral analysis. Author (GRA)

N77-30863# Stanford Univ., Calif. Dept. of Computer Science.

THE EXPECTED LINEARITY OF A SIMPLE EQUIVALENCE ALGORITHM

Donald E. Knuth and Arnold Schoenhage Mar. 1977 58 p refs
(Contracts N00014-76-C-0330; N00014-75-C-0661)
(AD-A040441; SU-STAN-CS-77-599) Avail: NTIS HC A04/MF A01 CSCL 12/1

The average time needed to form unions of disjoint equivalence classes, using an algorithm, is shown to be linear in the total number of elements. The analytic methods used to prove this result are of interest in themselves, as they are based on extensions of an approach to the study of random graphs. GRA

N77-30864# Stanford Univ., Calif. Dept. of Computer Science.

CONTROL OF THE DISSIPATIVITY OF LAX-WENDROFF TYPE METHODS FOR FIRST ORDER SYSTEMS OF HYPERBOLIC EQUATIONS

Tony F. C. Chan and Joseph Oliger Mar. 1977 140 p refs
(Contracts N00014-75-C-1132; N00014-75-C-0661)
(AD-A040399; SU-STAN-CS-77-604) Avail: NTIS HC A07/MF A01 CSCL 12/1

Lax-Wendroff methods for hyperbolic systems have two characteristics which are sometimes troublesome. They are sometimes too dissipative--they may smooth the solution excessively--and their dissipative behavior does not affect all modes of the solution equally. Both of these difficulties can be remedied by adding properly chosen accretive terms. We develop modifications of the Lax-Wendroff method which equilibrate the dissipativity over the fundamental modes of the solution and allow the magnitude of the dissipation to be controlled. We show that these methods are stable for the mixed initial boundary value problem and develop analogous formulations for the two-step Lax-Wendroff and MacCormack methods. Author (GRA)

N77-30865# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Computer Science.

CONVERGENCE AND COMPLEXITY OF INTERPOLATORY-NEWTON ITERATION IN A BANACH SPACE Interim Report

J. F. Traub and H. Wozniakowski Apr. 1977 34 p
(Contract N00014-76-C-0370)
(AD-A040272) Avail: NTIS HC A03/MF A01 CSCL 09/2

The class of Interpolatory-Newton iterations is defined and analyzed for the computation of a simple zero of a non-linear operator in a Banach space of finite or infinite dimension. Convergence of the class is established. The concepts of informationally optimal class of algorithms and optimal algorithm are formalized. For the multivariate case, the optimality of Newton iteration is established in the class of one-point iterations under an equal cost assumption. Author (GRA)

N77-30866# Loughborough Univ. of Technology (England). Dept. of Mathematics.

THE APPLICATION OF AUGMENTED PENALTY FUNCTIONS TO OPTIMAL CONTROL PROBLEMS

M. A. Connor and P. Saltavareas Jun. 1976 23 p refs
(MATHS-Res-99) Avail: NTIS HC A02/MF A01

Augmented penalty function methods in which the constrained problem is transformed into a problem without terminal constraints are described. The performance of the Connor and Vlach method is compared to other augmented penalty function methods. The former method is extended to delay systems. A conjugate gradient version is proposed. The numerical performance of the Connor and Vlach algorithm suggests that the method should be useful for a wide range of problems: however, a theoretical study of method convergence properties is required for the general applicability of the algorithm. ESA

N77-30867# Loughborough Univ. of Technology (England). Dept. of Mathematics.

TRANSFORMATIONS OF SYSTEM SIMILARITY ON STATE-SPACE SYSTEMS MATRICES OVER R[s, z]

M. Frost (Trent Polytech., Nottingham, Engl.) Sep. 1976 21 p refs
(MATHS-Res-102) Avail: NTIS HC A02/MF A01

Matrices over [s,z] which are extensions of the usual form of state-space system matrices over R[s] were considered. Work was aimed mainly at investigating under what conditions such matrices over R[s, z] are system similar over R[z]. It was found that these conditions involve not only the concept of decoupling factors of a system matrix over R[s, z] but also the new concept of decoupling zeros of such a system matrix. The connection of these decoupling zeros for a given system matrix with the corresponding transfer function matrix was also examined. Author (ESA)

N77-30868# Loughborough Univ. of Technology (England). Dept. of Mathematics.

RANGES OF LIAPUNOV TRANSFORMATIONS FOR OPERATOR ALGEBRAS

J. Kyle Nov. 1976 13 p refs
(MATHS-Res-105) Avail: NTIS HC A02/MF A01

Results obtained by Kyle on ranges of Liapunov transformations for Hilbert space were extended to the W^* - algebra setting. It was assumed that L sub A (Liapunov transformation corresponding to A) and L sub B (Liapunov transformation corresponding to B) are invertible. Let A be a C^* - algebra and let A+ denote the set of positive elements in A. Let A = L(H) for some Hilbert space H. It is shown that L sub A (A+) = L sub B (A+) and B-1/(a sub 1 + ia sub 2A)(a sub 3A + ia sub 4) where a sub i are real scalars with a sub 1 a sub 3 + a sub 2 a sub 4 = 1. It was shown that a similar result holds when A is any W^* - algebra, and the scalars a sub i are replaced by appropriate central elements of A. Before examining the general W^* - algebra, it is shown that exactly the same equivalence holds for irreducible C^* - algebras. ESA

N77-30869# Loughborough Univ. of Technology (England). Dept. of Mathematics.

PROPERTIES OF LIAPUNOV TRANSFORMATIONS FOR INFINITE DIMENSIONAL SPACES

J. Kyle Nov. 1976 14 p refs
(MATHS-Res-106) Avail: NTIS HC A02/MF A01

L sub A (Liapunov transformation corresponding to A) when A belongs to L(H), the set of all bounded linear operators on some Hilbert space H, was investigated. The spectrum of L sub A was determined, generalizing known results from the matrix case (i.e. that the eigenvalues of L sub A are all of the form a + conjugate of b where a and b are eigenvalues of A). Then the Liapunov's original result was generalized so that, given a positive matrix Q, there is a positive definite matrix P such that $AP + PA^* = -Q$, if all the eigenvalues of A have negative real part. ESA

N77-30870# Loughborough Univ. of Technology (England). Dept. of Mathematics.
OPERATOR BOUNDS FOR LIAPUNOV TRANSFORMATIONS
J. Kyle Dec. 1976 10 p refs
(MATHS-Res-107) Avail: NTIS HC A02/MF A01

The mapping X yields AX + XA(*) was investigated. Such a mapping, denoted by L sub A, is called a Liapunov transformation; A being a fixed bounded operator on some Hilbert space H (i.e. an element of L(H)), and L sub A considered as mapping L(H) into itself. An exact value in terms of A for // L sub A // was obtained. ESA

65 STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; and stochastic processes.

N77-30871 Alabama Univ., Birmingham.
THE COUNTING NORMAL DISTRIBUTION Ph.D. Thesis
George Frederic Brockman, IV 1976 166 p
Avail: Univ. Microfilms Order No. 77-6819

A Bayesian procedure for estimation and inference is described. Several tests, largely of heuristic value, were investigated for use in testing several kinds of hypothesis about counting normal populations. Geological data sets are included for purposes of illustration. In both cases, the data are at least very nearly counting normal. In one experiment, the random variable is the number of sandstone beds in a set of ten beds in a sequence of mixed lithology. The random variable in the other experiment is the number of potassium feldspar grains in a set of sixteen grains in modal analysis of a granite. Dissert. Abstr.

N77-30872 Pennsylvania State Univ., University Park.
POLYNOMIALS ORTHOGONAL WITH RESPECT TO A WEIGHT DISTRIBUTION Ph.D. Thesis
Robert Douglas Morton 1976 67 p
Avail: Univ. Microfilms Order No. 77-9581

A weight distribution is defined on a test space of entire functions of slow growth. However, this space does not include polynomials. Consequently, it is necessary to extend the distribution to a larger space. Various methods for constructing an appropriate extension are considered. These methods center around the concept of a Fourier transform for generalized functions. It is demonstrated that the techniques developed are suitable for treating the classical orthogonal polynomials. Moreover, it is shown that these methods are applicable to even broader classes of polynomials. Using the associated Laguerre polynomials as an example, weight distributions are constructed which extend the classical results. Dissert. Abstr.

N77-30873 Wayne State Univ., Detroit, Mich.
STATISTICAL INFERENCE CONCERNING THE CHANGE POINT IN A SEQUENCE OF INDEPENDENT RANDOM VARIABLES Ph.D. Thesis
Thomas Edward Snabb 1976 85 p
Avail: Univ. Microfilms Order No. 77-9452

Let X sub one ..., X sub n be independent random variables. We test the hypothesis, H, that X sub one... X sub n are identically distributed normal random variables with known variance sigma squared but unknown mean mu versus the alternate hypothesis, K, that beyond some point n, n = 1,2..., N-1, the random variables X sub n + 1..., X sub n shift by a known amount delta > 0. We consider translation invariant tests and using a uniform prior distribution derive the Bayes test. Empirical results for the power of the test are presented. The problem of estimating the change point, n, is also considered. Several other estimators for which small sample probabilities can be calculated are also presented. These are based on the maximum likelihood estimator. The problem of testing for a change in slope of a regression line is also considered. Test statistics based on ranks which maximize local average power are derived. Dissert. Abstr.

N77-30874 Pennsylvania Univ., Philadelphia.
ON THE SMALL-SAMPLE DISTRIBUTION OF THE LOG LIKELIHOOD STATISTIC FOR TESTING PARAMETRIC MULTINOMIAL MODELS Ph.D. Thesis
Franklin Lee Robinson 1976 254 p
Avail: Univ. Microfilms Order No. 77-10210

Multinomials defined by the standard Newtonian gravity model were considered. The hypothesis test of the model was compared to other multinomial models since the distribution of the log likelihood statistic for this hypothesis test was unknown the theoretical asymptotic theory was utilized. The applicability of these asymptotic results for parametric models with small sample sizes was considered. The rate of convergence of the distribution of the log likelihood statistic to its asymptotic distribution, and an approximation to the distribution when the sample size is too small for the symptotic results to hold was investigated. Dissert. Abstr.

N77-30875 Northwestern Univ., Evanston, Ill.
EXACT DISTRIBUTION OF A SAMPLE OF SIZE n FROM A DIRICHLET PROCESS Ph.D. Thesis
Behrooz Binesh Aghevli 1976 119 p
Avail: Univ. Microfilms Order No. 77-9994

A general formula for the distribution of a sample of a size n from a Dirichlet process is given. This result is used to generalize Antoniak's results. Given a sample of size n as above, there will be a probability distribution for the number of distinct observations in this sample. This distribution is explicitly exhibited and used to generalize the Korwar and Hollander estimator of the size of the parameter, sometimes interpreted as the degree of belief in the parameter. The main applications are the estimation of the size of the parameter of the process and the nonparametric estimation of a distribution function. In both instances, a program in SNOBOL generates the necessary combinations of the n neighborhoods where the observations have fallen. Programs in FORTRAN are used to complete the necessary computations. Dissert. Abstr.

N77-30876 George Washington Univ., Washington, D.C.
EARLY STOPPING AND OTHER PROPERTIES OF CLOSED SEQUENTIAL TESTS FOR BINOMIAL DISTRIBUTIONS Ph.D. Thesis
James Matthew Dambrosia 1976 197 p
Avail: Univ. Microfilms Order No. 77-10125

Three classes of restricted sequential tests that are based on a discussion are given of probabilistic modifications of the H sub zero acceptance boundaries of Armitage restricted sequential tests. Under H sub zero these modified tests have the potential for early stopping with the acceptance of H sub zero, and they also have expected stopping times close to those of the Wald sequential probability ratio tests. The first modified restricted sequential plan proposed achieves early possible stopping and reduced expected stopping time under H sub zero at the sacrifice of a slight reduction in power. However, the loss in power is predictable and can be controlled in the design of the sequential plan. The other two modified restricted sequential plans that are given, preserve the specified error probabilities as well as providing a measure of early possible stopping and reduction of expected stopping time under H sub zero. The cost of perserving error probabilities is an increased truncation point. Dissert. Abstr.

N77-30877 Pennsylvania State Univ., University Park.
A NEW MULTIVARIATE LIFE DISTRIBUTION Ph.D. Thesis
Dennis Sigmund Friday 1976 103 p
Avail: Univ. Microfilms Order No. 77-9666

Bivariate life distributions which possess the no ageing or loss of memory property were developed. General properties were studied and independence transformations were derived. Dissert. Abstr.

N77-30878 Southern Methodist Univ., Dallas, Tex.
ON G-SPECTRAL ESTIMATION Ph.D. Thesis
Alton Glen Houston 1976 152 p
Avail: Univ. Microfilms Order No. 77-9785

The purpose of this study is to extend the theory and application of the G-spectral estimator to both continuous and discrete stochastic processes, with particular emphasis on the class of processes known as autoregressive-moving average (ARMA) processes. Theorems are given stating the exactness property of the G-spectral estimator for this class. An algorithm,

developed by W. C. Pye in 1972 for calculating higher order G sub n transformations recursively, is utilized for calculation of the G-spectral estimator recursively. Properties of this algorithm are given that suggest a procedure for determining the correct order transformation to use in calculating the G-spectral estimator. These properties also yield a new method for determining both the order of the autoregressive operator and the order of the moving average operator of an ARMA process. The results of Monte Carlo studies comparing the G-spectral estimator with the window techniques of Bartlett, Tukey, and Parzen, the autoregressive spectral estimator, and the maximum entropy spectral estimator are given. Dissert. Abstr.

N77-30879# California Univ., Los Angeles. Dept. of System Science.
PARAMETER INVESTIGATION IN STOCHASTIC DIFFERENTIAL SYSTEMS: THEORY AND APPLICATION Interim Report
A. V. Balakrishnan Jan. 1977 53 p refs
(Grant AF-AFOSR-2492-73)
(AD-A039182; AFOSR-77-0430TR) Avail: NTIS HC A04/MF A01 CSCL 12/1

This paper presents a theory of estimation of parameters in linear stochastic differential equations based on time-continuous observation. It uses a white noise model to represent observation errors (in contrast to a Wiener process model). The application is to the problem of identifying aircraft as well as turbulence (wind-gust) parameters from flight test data. Results obtained on actual data are presented. GRA

N77-30880# Indiana Univ., Bloomington. Dept. of Mathematics.
ASYMPTOTIC NORMALITY AND CONVERGENCE RATES OF LINEAR RANK STATISTICS UNDER ALTERNATIVES Interim Report
Madan L. Puri and Navaratna S. Ravaram (Kent State Univ., Ohio) 1977 18 p refs
(Grant AF-AFOSR-2927-76)
(AD-A039208; AFOSR-77-0451TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

Asymptotic normality of linear rank statistics under alternatives is proved employing techniques of Chernoff and Savage. Under suitable assumptions the rate of convergence to normality under alternatives is also obtained for such statistics. The results of the paper are related to those of Hajek and Hoeffding. Results on the rate of convergence extend those of Jureckova and Puri and Bergstrom and Puri. GRA

N77-30881# Indiana Univ., Bloomington. Dept. of Mathematics.
STOCHASTIC INTEGRALS OF WEIGHTED EMPIRICAL PROCESSES AND AN APPLICATION TO THE LIMIT DISTRIBUTION OF LINEAR RANK STATISTICS UNDER ALTERNATIVES Interim Report
Navaratna S. Rajaram 1977 33 p refs
(Grant AF-AFOSR-2927-76)
(AD-A039197; AFOSR-77-0450TR) Avail: NTIS HC A03/MF A01 CSCL 12/1

The distribution under alternatives of a simple linear rank statistic S sub n is governed by the following entities: a set of regression constants (series C from nl to nn), scores (series a from nl to nn) and distribution functions (series F from nl to nn). One usually assumes the scores to be generated by a known function phi. GRA

N77-30882# South Carolina Univ., Columbia. Coll. of Engineering.
CONCEPT AND USE OF MODELS, PARTS 1 AND 2
W. H. Hoppmann, II Mar. 1977 329 p refs
(Contract DAAD05-74-C-0722)
(AD-A039312; AMSAA-TR-187-Pt-1; AMSAA-TR-187-Pt-2) Avail: NTIS HC A15/MF A01 CSCL 12/1

An attempt is made to present a unified view of modeling. Beginning with the earliest concept of model a brief history of the subject is presented for the period beginning from prehistoric times into the twentieth century. The evolution of the concept of model is discussed in some detail and a taxonomy of the subject is suggested. Special attention is given to the relationship between the concept of model and the prevailing ideas of space, time, and matter. The role of dimensional analysis is reviewed and its relationship to modeling examined at length. Specific types of models which constitute the taxonomy are defined and illustrated with numerous examples. The idea of a Newtonian model is introduced and then extended to cover many physical cases. The new concept of disclosive model and its role is defined and illustrated. Its historical origin is reviewed. Its value in the evolution of generalized modeling is examined at length. GRA

N77-30883# North Carolina Univ., Chapel Hill.
SAMPLING FROM THE BINOMIAL DISTRIBUTION ON A COMPUTER
George S. Fishman May 1977 19 p refs
(Contract N00014-76-C-0302)
(AD-A039196; TR-77-4) Avail: NTIS HC A01/MF A01 CSCL 12/1

This paper describes a method of sampling from the binomial distribution beta(n,p) that appears less costly than the beta method recently suggested by Relles and Ahrens and Dieter. The method uses the acceptance-rejection technique together with an efficient sampling algorithm for the Poisson distribution. GRA

N77-30884# North Carolina Univ., Chapel Hill.
ESTIMATING THE MEAN OF A CORRELATED BINARY SEQUENCE WITH AN APPLICATION TO DISCRETE EVENT SIMULATION
George S. Fishman and Louis R. Moore Apr. 1977 32 p refs
(Contract N00014-76-C-0302)
(AD-A039195; TR-77-2) Avail: NTIS HC A03/MF A01 CSCL 12/1

A procedure is discussed for interval estimation of the mean theta of a correlated binary (0,1) sequence. The method assumes that the sequence is strictly stationary and that a particular string of m binary digits is a recurrent event in the sequence, where m greater than or equal to 1 is unknown. Of the 2m squared choices for the possible recurrent events, the strings of all zeros and of all ones are examined. Author

N77-30885# Naval Postgraduate School, Monterey, Calif.
METHODOLOGY FOR EFFICIENCY AND ALTERATION OF THE LIKELIHOOD SYSTEM
Robert R. Read 15 Mar. 1977 42 p refs
(AD-A039347; NPS-55-77-9) Avail: NTIS HC A03/MF A01 CSCL 12/1

Although maximum likelihood estimates are asymptotically efficient, they are often very hard to find. If this difficulty is caused by some, but not all, of the equations in the system it may be possible to alter the system and make it more manageable. The asymptotic covariance matrix of the new estimate is related to the information matrix. This relationship is characterized and some interpretations are made. Background material on efficiency and lower bounds is included. Author (GRA)

N77-30886# Purdue Univ., Lafayette, Ind. Dept. of Statistics.
ON SOME DECISION-THEORETIC CONTRIBUTIONS TO THE PROBLEM OF SUBSET SELECTION
Jason C. Hsu Jun. 1977 76 p refs
(Contract N00014-75-C-0455; NR Proj. 042-423)
(AD-A040545; MIMEO-SER-491) Avail: NTIS HC A05/MF A01 CSCL 12/1

Ranking and selection procedures, subset selection procedures in particular, are procedures that provide in a realistic manner attractive ways of handling problems that are commonly treated by the 2-action procedure of a global F-test, and the many-action procedure of a typical multiple range test. Consider the usual one-way layout situation in analysis of variance. In this situation, formulating the problem as a selection problem is appropriate. Subset selection procedures are often thought of as screening procedures. If the data indicates several treatments are better than the remaining treatments but no treatment is clearly the best, then perhaps the experimenter ought to retain all of the better treatments for future considerations. GRA

N77-30887# Loughborough Univ. of Technology (England). Dept. of Mathematics.
TESTS FOR THE EXPONENTIAL DISTRIBUTION WITH

CENSORED DATA USING CRAMER-VON MISES STATISTICS
A. N. Pettitt May 1976 20 p refs
(MATHS-Res-98) Avail: NTIS HC A02/MF A01

Modifications of Cramer-von Mises type statistics were considered so that the statistics can be used to test the goodness-of-fit of censored data to the exponential distribution. Percentage points are given for the statistics. Other methods based on weighted spacings are described, and their powers compared with the tests in small samples, using simulation, for type 2 censoring. The new tests tend to be generally more powerful than those based on the weighted spacings and can be used with either type 1 or type 2 censored data.
Author (ESA)

N77-30888# Loughborough Univ. of Technology (England). Dept. of Mathematics.
TESTS FOR MULTIVARIATE NORMALITY
A. N. Pettitt Jul. 1976 24 p refs
(MATHS-Res-100) Avail: NTIS HC A02/MF A01

Details of a method for testing for multivariate normality based on the principal components are given. Asymptotic and small sample percentage points are given for a version of the Anderson-Darling statistic used in this contest. This method is compared with one based on the normalized radial distances and it is shown, by simulation results, that the test based on the principal components is sensitive to skew alternative distributions, whereas the test based on the radial distances can be biased. Also, comparisons are made with Mardia's measures of multivariate skewness and kurtosis. Finally, data of Rao's are analyzed, with the assumption of normality being tested. Author (ESA)

N77-30889# Loughborough Univ. of Technology (England). Dept. of Mathematics.
GENERALIZED CRAMER-VON MISES STATISTICS FOR THE GAMMA DISTRIBUTION
A. N. Pettitt Jan. 1977 20 p refs
(MATHS-Res-108) Avail: NTIS HC A02/MF A01

Generalized Cramer-von Mises statistics for testing for the Gamma distribution with known scale parameter were investigated. It is shown that the statistics can be written as an infinite sum of uncorrelated components which are polynomial functions of the original observations. These components are shown to be related to linear functions of order statistics. Simple modifications are made when the scale parameter has to be estimated. Finally, the asymptotic power of the statistic for testing of the exponential distribution with unknown scale parameter against various alternatives is given and compared with other statistics, such as Weibull and Laguerre polynomial alternatives. Author (ESA)

N77-30890# North Carolina Univ., Chapel Hill.
DEPENDENCE PROPERTIES OF INTEGRATED GENERALIZED BIVARIATE FARLIE-GUMBEL-MORGENSTERN DISTRIBUTIONS
S. Kotz and N. L. Johnson Mar. 1977 13 p
(Contract DAAG29-74-C-0030; Grant AF-AFOSR-2837-75)
(AD-A040331; Mimeo-Ser-1106; ARO-11959.13-M) Avail: NTIS HC A02/MF A01 CSCL 12/1

Farlie-Gumbel-Morgenstern distributions allow for only a limited degree of dependence between the variables. Some modifications, designed to increase dependence, are discussed. It is found that only a limited increase in dependence is feasible with these modifications. Author (GRA)

N77-30891# North Carolina Univ., Chapel Hill. Dept. of Statistics.
ESTIMATION AND PREDICTION ON NONLINEAR FUNCTIONALS OF GAUSSIAN PROCESSES Interim Report
Stamatis Cambanis 1977 7 p
(Grant AF-AFOSR-2796-75)
(AD-A040309; AFOSR-77-0617TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

The general estimation problem of nonlinear functionals of Gaussian processes is solved via the tensor product structure of nonlinear space in the sense that the nonlinear problem reduces to a standard linear estimation problem, the theory of which has been well developed. Also introduced the concept of super predictor for a class of prediction problems and a lower bound for the mean square error of the nonlinear prediction is derived.
GRA

N77-30892# North Carolina Univ., Chapel Hill. Dept. of Statistics.
COMPLETENESS COMPARISONS AMONG SEQUENCES OF SAMPLES. 2: CENSORING FROM ABOVE OR BELOW AND GENERAL CENSORING
N. L. Johnson Feb. 1977 24 p refs
(Contract DAAG29-74-C-0030)
(AD-A040240; Mimeo-Ser-1103; ARO-11959.12-m) Avail: NTIS HC A02/MF A01 CSCL 12/1

Two sequences of samples are available, and it is known that just one sequence represents the remainder of original random samples which have been censored. Methods of deciding which sequence has been censored are described, for the cases of (a) censoring from above or below (b) general censoring. It is not necessary to know the population distribution of the observed characteristic to apply the method. There is some calculation and discussion of the accuracy of the methods. Author (GRA)

66 SYSTEMS ANALYSIS

Includes mathematical modeling; network analysis; and operations research.

N77-30893 Illinois Univ., Urbana-Champaign.
ON ROBUST STATE ESTIMATION FOR UNCERTAIN SYSTEMS Ph.D. Thesis
Anthony Vincent Sebald 1976 73 p
Avail: Univ. Microfilms Order No. 77-9178

Minimax state estimation for uncertain systems is discussed. The conservative performance of the standard minimax estimator in the absence of an intelligent adversary is reduced by a combined detector estimator structure and an incremental mean squared error performance criterion. The optimal structure is defined for a wide class of linear and nonlinear systems whose uncertain parameters are elements of some known compact space. Since the complete specification of the optimal estimator detector is problem dependent, a computational procedure is outlined. Singularly perturbed systems in which the small parameter is of unknown value are also analyzed. It is shown that the combined detector estimator and incremental mean square error combination provide significantly better performance than existing methods. Examples indicate improvement of factors of two to five in the estimation error at a cost of slightly double the complexity.
Dissert. Abstr.

N77-30894 Pennsylvania Univ., Philadelphia.
A BAYESIAN METHOD OF SEARCH FOR MULTIMODAL UNIVARIATE FUNCTIONS Ph.D. Thesis
Kishore Bhujanga Vira Buddhiraju 1976 106 p
Avail: Univ. Microfilms Order No. 77-10141

A search for the global maximum of a multimodal function of a single variable is detailed. A Bayesian framework is used to divide the region of investigation into subregions in each of which unimodal searches have been conducted. Dissert. Abstr.

N77-30895# Stanford Univ., Calif. Dept. of Computer Science.
THE ANALYSIS OF A PRACTICAL AND NEARLY OPTIMAL PRIORITY QUEUE
Mark R. Brown Mar. 1977 106 p refs
(Contract N00014-76-C-0330; Grant NSF MCS-72-03752)
(AD-A040538; SU-Stan-CS-77-600) Avail: NTIS HC A06/MF A01 CSCL 12/2

The properties of the binomial queue, a new data structure for implementing priority queues that can be efficiency merged are explored in detail. New methods of representing binomial queues are given which reduce the storage overhead of the structure and increase the efficiency of operations on it. One of these representations allows any element of an unknown priority queue to be deleted in log time, using only two pointers per element of the queue. A complete analysis of the average time for insertion into and deletion from a binomial queue is performed.

This analysis is based on the result that the distribution is obtained after repeated insertions and deletions. GRA

N77-30896# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
QUEUEING NETWORK MODEL FOR PERFORMANCE EVALUATION OF THE DECSYSTEM-10 M.S. Thesis
Leslie E. McKenze, Jr. Mar. 1977 201 p refs
(AD-A039719; AFIT/GCS/EE/77-1) Avail: NTIS HC A10/MF A01 CSCL 09/2

A closed queueing network model of the DECsystem-10 at the Air Force Avionics Laboratory (AFAL), Wright-Patterson AFB, Ohio was developed. This model was developed to provide personnel at the Avionics Laboratory with a computer performance evaluation (CPE) tool which they could use to improve the performance of their DECsystem-10. The hardware configuration and operating system features of the DECsystem-10 are discussed in this report. Features which affect performance are emphasized. Validation experiments indicated that the closed queueing network model described in this report is a viable CPE tool for the DECsystem-10. A possible improvement to the model would be the inclusion of the effect that swapping has on performance measures in time-sharing computer systems. GRA

N77-30897# Massachusetts Inst. of Tech., Cambridge. Operations Research Center.
ON THE SOLUTION OF CONVEX KNAPSACK PROBLEMS WITH BOUNDED VARIABLES
Gabriel R. Bitran and Arnold C. Hax Apr. 1977 18 p refs
(Contract N00014-75-C-0556)
(AD-A039164; TR-129) Avail: NTIS HC A02/MF A01 CSCL 12/2

In this paper, a recursive method is presented to solve separable differentiable convex knapsack problems with bounded variables. The method differs from classical optimization algorithms of convex programming and determines at each iteration the optimal value of at least one variable. Applications of such problems are frequent in resource allocation and recently have shown to be useful in hierarchical production planning. Computational results are presented. GRA

N77-30898# Naval Postgraduate School, Monterey, Calif.
MODELING AND ESTIMATING SYSTEM AVAILABILITY
Donald P. Gaver Jan. 1977 68 p refs
(AD-A039943; NPS-55-77-4) Avail: NTIS HC A04/MF A01 CSCL 12/2

A variety of probability models for single and multiple unit, failure-prone but repairable, systems are reviewed. The purpose of the paper is to provide methods for expressing the uncertainties in system availability in terms of uncertainties in component parameters. A log-linear transformation and the jackknife are shown to be effective. Author (GRA)

N77-30899# Rochester Univ., N. Y. Graduate School of Management.
OPTIMAL MANAGEMENT POLICY FOR THE M/G/ QUEUE WITH HETEROGENEOUS USERS Final Report
Robert J. Dolan (Chicago Univ., Ill.) Dec. 1976 25 p refs
(Grant NSF NM-44241)
(PB-267075/0) Avail: NTIS HC A02/MF A01 CSCL 12B

The administrator of a service facility must specify the rule which determines the order of service to waiting users. The total delay cost to users can be minimized only if the system administrator takes the per unit time delay cost and service requirement into account. Specifically, for the M/G/1 queue with nonpreemptive service, the total expected delay cost to users is minimized by serving users in descending order of the true per unit time delay cost divided by the expected service requirement. A priority pricing mechanism which structures a situation such that a user maximizes his individual welfare by revealing his true per unit time delay cost and expected requirement is developed. The user's objective function is formalized, the priority pricing algorithm specified, and then it is proven that the stated aim is accomplished. An example of the process is also given and future extensions are noted. GRA

67 THEORETICAL MATHEMATICS

Includes topology and number theory.

N77-30900 North Texas State Univ., Denton.
R0 SPACES, R1 SPACES AND HYPERSPACES Ph.D. Thesis
Charles Irvin Dorsett 1976 103 p
Avail: Univ. Microfilms Order No. 77-11100

R sub 0 and R sub one spaces are investigated and additional theorems that can be generalized from a T sub 2 setting to an R sub one setting are obtained. Characterizations of R sub 0 spaces, R sub one spaces, regular spaces, completely regular spaces, and normal R sub 0 spaces are obtained using T sub 0 identification spaces, T sub 0 identification spaces are investigated for R sub 0 spaces. The same result is obtained, where metric continuum is replaced by R sub 0 and the same characterizations for local connectedness and connectedness im kleinen are obtained for K(X),E(X) sub K(X) at elements of C(X) intersects K(X) for (X,T), an R sub 0 space. If (X,T) is a metric continuum and A is a member of 2 to the X power, then the statements (I)2 to the X power is locally connected (connected im kleinen) at each component of A are equivalent. The relationships between statements (I) and (II) are investigated for (X,T) weaker than a metric continuum and the result is obtained. Dissert. Abstr.

N77-30901 Ohio Univ., Athens.
A STUDY OF CERTAIN CLASSES OF ISOCOMPACT SPACES AND OF THE RELATIONSHIPS AMONG THEM Ph.D. Thesis
Sheldon Walter Davis 1976 62 p
Avail: Univ. Microfilms Order No. 77-10456

The study considers several large subclasses of the class of all isocompact spaces. These fall into three basic types. A number of generalizations of symmetrizability of the type defined by Harley and Stephenson are discussed. In particular, the class of F sub r spaces which is a smaller class than the class of F spaces of Harley and Stephenson is defined. Certain covering properties which generalize paracompactness and metacompactness are also defined. The last type of condition considered is again a generalization of paracompactness. Finally, relationships among the classes defined by the properties mentioned above are discussed. It is established that all F sub r spaces satisfy the L-type properties. A group of properties is defined which is a common generalization of the L-type properties and the theta-type properties and still implies isocompactness. Also it is found that in the presence of these new properties hereditary S sub one compactness implies the Lindelof property. Dissert. Abstr.

N77-30902 Bowling Green State Univ., Ohio.
ON MANIPOLD GROUPS: A GENERALIZATION OF THE CONCEPT OF CYCLICALLY ORDERED GROUPS Ph.D. Thesis
Janet Dale Blair 1976 79 p
Avail: Univ. Microfilms Order No. 77-10881

Cyclically ordered groups are considered to be groups which are locally totally ordered and generalized to groups which are locally partially ordered. An analog for Rieger's theorem for cyclically ordered sets is proven and a manipold is defined as a set, S, together with a collection, of partially ordered subsets of S, which covers S, and satisfies a given compatibility condition. Totally ordered sets and cyclically ordered sets are characterized as manipolds satisfying certain conditions. It is proven that structure preserving permutations of totally ordered sets and cyclically ordered sets coincide with permutations which are ordered preserving and cyclical-order preserving, respectively. Finally cyclically ordered groups and totally ordered groups are characterized as manipold groups; Rieger's theorem is restated in manipold language; and a partial generalization of Rieger's theorem is proven. Dissert. Abstr.

70 PHYSICS (GENERAL)

For geophysics see *46 Geophysics*. For astrophysics see *90 Astrophysics*. For solar physics see *92 Solar physics*.

N77-30903 Auburn Univ., Ala.
THE ROTATIONAL MOTION OF AN EXTENDED BODY IN GENERAL RELATIVITY Ph.D. Thesis
Felix R. Hoots, Jr. 1976 140 p
Avail: Univ. Microfilms Order No. 77-9941

The conservation equation of general relativity is used as a basis to derive, through first order in post-Newtonian corrections, general relativistic equations (GRE) of rotational motion of an extended body to include terms through quadrupole order in the body. Classical Poisson equations (PE) are used to study the attitude motions of a spinning gyroscope about its center of mass. The method of averaging is used to obtain a transformation of variables for the nonresonance case which significantly simplifies the Poisson differential equations. The transformed equations are then integrated to obtain long-term solutions. These solutions may be used to predict both the orientation of the body with respect to a nonrotating coordinate system with origin at the center of mass of the body and the motion of its spin angular momentum vector with respect to this coordinate system. Dissert. Abstr.

N77-30904 Maryland Univ., College Park.
DYNAMIC STABILITY OF ONE-DIMENSIONAL NONLINEARLY VISCO-ELASTIC BODIES Ph.D. Thesis
Russell Cleveland Browne 1976 95 p
Avail: Univ. Microfilms Order No. 77-9491

A hierarchy of one dimensional theories is obtained by restraining the motion in the theory of three dimensional nonlinear viscoelastic bodies. A mathematical model which incorporates one dimensional versions of frame indifference and orientation-preservation was developed. The stability in the sense of Lyapunov of equilibrium states under very general boundary conditions is analyzed. The implicit function theorem reduces the stability question to the determination of the locus of singularities of a certain resolvent operator. Sufficient conditions are given for the solutions to be stable in the space of functions with two Holder continuous derivatives. It is shown that the displacement from a stable equilibrium configuration decays exponentially to zero. For a conservative loading, it is shown that stability is determined entirely by the elastic part of the equations of motion.
Dissert. Abstr.

71 ACOUSTICS

Includes sound generation, transmission and attenuation.

For noise pollution see *45 Environment Pollution*.

N77-30905*# Bolt, Beranek, and Newman, Inc., Canoga Park, Calif.
COHERENCE AND PHASE TECHNIQUES APPLIED TO NOISE DIAGNOSIS IN THE NASA AMES 7 TIMES 10-FOOT WIND TUNNEL NO. 1
J. F. Wilby, A. G. Piersol, P. E. Rentz, and T. D. Scharton 18 Jul. 1977 62 p refs
(Contract NAS2-8382)
(NASA-CR-152039; BBN-3559) Avail: NTIS HC A04/MF A01 CSCL 20A

Measurements have been made of coherence and phase spectra for the acoustic field in a subsonic wind tunnel. The data are interpreted in terms of simple analytical models for propagating and diffuse noise fields, including the presence of uncorrelated noise signals. It is found that low frequency noise propagates upstream and downstream from the fan, with the noise in the test section arriving in the upstream direction. High frequency sound is generated in the test section and propagates upstream and downstream. In the low frequency range, the ratio of diffuse to propagating energy is about eight for all locations in the test section, diffuser, and settling chamber; the value of the ratio increases with frequency. Author

N77-30906*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
ACCURACY OF THE KIRCHOFF FORMULA IN DETERMINING ACOUSTIC SHIELDING WITH THE USE OF A FLAT PLATE
Ralph E. Gabrielsen and Joseph E. Davis Aug. 1977 20 p refs Prepared in cooperation with US Army Air Mobility Res. and Develop. Lab., Moffett Field, Calif.
(NASA-TM-73261; A-7111) Avail: NTIS HC A02/MF A01 CSCL 20A

It has been suggested that if jet engines of aircraft were placed at above the wing instead of below it, the wing would provide a partial shielding of the noise generated by the engines relative to observers on the ground. The shielding effects of an idealized three-dimensional barrier in the presence of an idealized engine noise source was predicted by the Kirchoff formula. Based on the good agreement between experimental measurements and the numerical results of the current study, it was concluded that the Kirchoff approximation provides a good qualitative estimate of the acoustic shielding of a point source by a rectangular flat plate for measurements taken in the far field of the flat plate at frequencies ranging from 1 kHz to 20 kHz. At frequencies greater than 4 kHz the Kirchoff approximation provides accurate quantitative predictions of acoustic shielding. Author

N77-30907*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
NOISE TRANSMISSION BY VISCOELASTIC SANDWICH PANELS
Rimas Vaicaitis Aug. 1977 42 p refs
(NASA-TN-D-8516; L-11523) Avail: NTIS HC A03/MF A01 CSCL 20A

An analytical study on low frequency noise transmission into rectangular enclosures by viscoelastic sandwich panels is presented. Soft compressible cores with dilatational modes and hard incompressible cores with dilatational modes neglected are considered as limiting cases of core stiffness. It is reported that these panels can effect significant noise reduction. Author

N77-30908*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
FINITE-DIFFERENCE THEORY FOR SOUND PROPAGATION IN A LINED DUCT WITH UNIFORM FLOW USING THE WAVE ENVELOPE CONCEPT
Kenneth J. Baumeister Washington Aug. 1977 64 p refs
(NASA-TP-1001; E-9149) Avail: NTIS HC A04/MF A01 CSCL 20A

Finite difference equations are derived for sound propagation in a two dimensional, straight, soft wall duct with a uniform flow by using the wave envelope concept. This concept reduces the required number of finite difference grid points by one to two orders of magnitude depending on the length of the duct and the frequency of the sound. The governing acoustic difference equations in complex notation are derived. An exit condition is developed that allows a duct of finite length to simulate the wave propagation in an infinitely long duct. Sample calculations presented for a plane wave incident upon the acoustic liner show the numerical theory to be in good agreement with closed form analytical theory. Complete pressure and velocity printouts are given to some sample problems and can be used to debug and check future computer programs. Author

N77-30909*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
ACOUSTIC PERFORMANCE OF TWO 1.83-METER-DIAMETER FANS DESIGNED FOR A WIND-TUNNEL DRIVE SYSTEM
Paul R. Soderman and V. Robert Page Aug. 1977 76 p refs Prepared in cooperation with US Army Air Mobility Research and Development Lab., Moffett Field, Calif.
(NASA-TP-1008; A-6888) Avail: NTIS HC A05/MF A01 CSCL 20A

A parametric study was made of the noise generated by two 1.83-m (6-ft) diameter fans operating up to a maximum pressure ratio of 1.03. One fan had 15 rotor blades, 23 stator blades, and a maximum rotational speed of 1200 rpm. The other fan had 9 rotor blades, 13 stator blades, and a maximum speed of 2,000 rpm. The fans were approximately 1/7-scale models of the 12.2-m (40-ft) diameter fans proposed for repowering the NASA-Ames 40- by 80 foot wind tunnel. The fans were operated individually in a 23.8-m (78-ft) long duct. Sound pressure levels in the duct were used to determine radiated acoustic

power as fan speed, blade angle, and mass flow were varied. Results show that the low speed fan was slightly quieter than the high speed fan and, when scaled to full scale, would be 16 db quieter than the present wind tunnel fans. The fan noise varied directly with thrust regardless of whether thrust was varied by rotational speed or blade setting for the ranges studied.
Author

N77-30910# Naval Postgraduate School, Monterey, Calif.
DEVELOPMENT OF A FLEXURAL DISK TRANSDUCER FOR ACOUSTIC TRACKER OF UNDERWATER VEHICLES M.S. Thesis
Omer Sevdik Dec. 1976 70 p refs
(AD-A039323) Avail: NTIS HC A04/MF A01 CSCL 17/1

A high frequency, broad-band transducer which has a broad radiation pattern in a half space is required for acoustic tracking of underwater vehicles. Two models of a flexural disk transducer, were built and tested. It was found that the radiation loading in water completely damps the resonances due to standing flexural waves and the radiation apperas to be due entirely to flexural waves propagating in the disk. Broad-band radiation patterns and broad bandwidth (60-80 kHz) were obtained. The discrepancies between theory and experiment are attributed in part to violation of the thin plate assumptions and to lack of knowledge of the actual velocity distributions. This approach offers promise for achieving the desired broad beam widths. However, additional development work is needed to obtain a transducer which has the curved face necessary for smooth hydrodynamic flow. GRA

N77-30911# Yale Univ., New Haven, Conn. Dept. of Engineering and Applied Science.
SCATTERING OF UNDERWATER ACOUSTIC SIGNALS FROM A ROUGH MOVING SURFACE Final Report, 15 Nov. 1973 - 15 Nov. 1976
Franz B. Tuteur, John C. Zornig, and Henti Tung 1 Jun. 1977 22 p refs
(Contract N00014-75-C-0298; NR Proj. 083-322)
(AD-A040844; CS-0298-1; S/IS-7705) Avail: NTIS HC A02/MF A01 CSCL 20/1

The research dealt with surface scattering and consisted of an experimental as well as a theoretical component. The experimental work was conducted in a model tank equipped with a wind tunnel to produce a wind-driven surface. The tank is very well instrumented and interfaced to a computer so that the experimental results can be accepted with considerable confidence. Four separate projects are included in the work covered by this report. These are: (1) calculation and measurement of first and second-order moments of the channel transfer function (2) spatial correlation between two receivers (3) power scattered in directions other than forward; and (4) asymmetric Doppler amplitudes in forward scatter. Each one of these projects is briefly discussed and summarized. (GRA)

N77-30912# TRW Defense and Space Systems Group, Redondo Beach, Calif.
FEASIBILITY DEMONSTRATION OF FIBER OPTIC DETECTION OF LOW FREQUENCY SOUND Final Report, 1 Apr. 1976 - 28 Feb. 1977
J. H. Cole, R. L. Johnson, and P. G. Bhuta 25 Apr. 1977 41 p refs
(Contract N00014-76-C-0490; NR Proj. 089-117)
(AD-A040382; AT-SSD-TR-77-3) Avail: NTIS HC A03/MF A01 CSCL 17/1

The response of an optical fiber in water to low frequency acoustic waves was investigated experimentally and compared with analytical results. A change in the optical index of refraction of the fiber creates an effective path length change for the optical beam which results in a phase shift of the beam with respect to a reference beam unaltered by the acoustic field. By mixing the phase shifted beam with a reference beam of constant phase on a photodetector, the phase variation at the acoustic frequency is detected. Potential Navy applications of this technology for acoustic arrays are discussed. Author (GRA)

N77-30913# National Aerospace Lab., Amsterdam (Netherlands). Fluid Dynamics Div.
SOUND TRANSMISSION IN AND RADIATION FROM HARD-WALLED ANNULAR DUCTS RELATED TO FAN ENGINE INLETS
J. N. Laan 6 Nov. 1975 98 p refs
(Contract NIVR-1773)
(NLR-TR-75144-U) Avail: NTIS HC A05/MF A01

The sound propagation, radiation, and field in a hard-walled annular duct of finite length was investigated. The individual modal solutions so found are described. The main properties calculated include the modal intensity and the modal far field directivity pattern. The modal intensity is determined by the rate of mode excitation and mode excitation by various sound sources is discussed. Author (ESA)

N77-30914# Naval Research Lab., Washington, D. C.
MATHEMATICAL THEORY OF THE FLUCTUATION OF ACOUSTIC SIGNALS IN THE OCEAN, PART 1, 1976-1977
Sam Hanish Apr. 1977 180 p refs
(AD-A040108; NRL-MR-3476) Avail: NTIS HC A09/MF A01 CSCL 20/1

The mathematical theory of the fluctuations of acoustic signals in transit through the ocean is reviewed in detail. First the experimental basis of the theory is presented using recent data. Then a series of mathematical equations are critically reviewed as to their validity and range of application in describing acoustic fluctuations. Then a list of solutions of these equations is discussed, including Born, Parabolic, Dyson, Bethe-Salpeter, Markov, De Wolf, Beran, Mode Coupling, Diffracting Screens, Middleton, Monte Carlo Ray- Optic Palmer, and De Santo. Author (GRA)

N77-30915# Aeronautical Research Labs., Melbourne (Australia).
ABSORPTION OF TRANSMITTED ULTRASOUND IN BRAGG DIFFRACTION IMAGING
P. A. Doyle Apr. 1976 15 p refs
(PB-266908/3; ARL/Mat.100) Avail: NTIS HC A02/MF A01 CSCL 14B

The influence of ultrasound absorption in the water of the Bragg cell of a material defect imaging system is studied theoretically. It is shown that the optical image formed is that of a distorted sound field which can be written in terms of the unattenuated acoustical spectrum and geometrical factors. The absorption causes a loss of resolution as well as of sensitivity. Compared with the restriction on resolution due to the small numerical aperture of the optical system, this absorption loss increases from only 5.4 percent at 20 MHz to 66 percent at 70 MHz, for a typical experimental arrangement. This loss of resolution could be reduced by increasing the temperature of the water in the Bragg cell. GRA

72 ATOMIC AND MOLECULAR PHYSICS

Includes atomic structure and molecular spectra.

N77-30916 Johns Hopkins Univ., Baltimore, Md.
A STUDY OF THE BENDING AND ROTATION OF LINEAR TRIATOMIC MOLECULES Ph.D. Thesis
Paul Albert Lucas 1975 166 p
Avail: Univ. Microfilms Order No. 77-7746

In a quantum-mechanical study of the linear triatomic molecule, bending motion is taken to correspond in zero order to the motion of a two-dimensional isotropic harmonic oscillator (2DHO). The rich Lie-algebraic structure associated with this system is used to define relevant operators and to determine matrix elements. Derivation of the non-relativistic kinetic energy operator for a linear triatomic molecule is presented. The bending vibrational part of the kinetic energy of the symmetric ABA molecule is shown to be expressible entirely in terms of operators belonging to the above-mentioned Lie algebra. The quantum-mechanical kinetic energy expression for an arbitrary triatomic molecule with arbitrary choice of molecule-fixed axes is also derived. The bending vibrational motion of C is studied; the kinetic energy terms cannot account for the experimentally observed divergence of the level spacings. An expression is derived for the l type doubling constant of rotating molecules when large amplitude bending is taking place, as in C3. Vibronic effects are studied, deriving the vibronic perturbation terms and the

Renner matrix elements, and reviewing the Zeeman effect in triatomic molecules. Dissert. Abstr.

N77-30917 Pennsylvania State Univ., University Park.
SLOW FIELD EVAPORATION OF TRANSITION METALS IN NEON AND HYDROGEN Ph.D. Thesis
Shukla Kapur 1976 135 p
Avail: Univ. Microfilms Order No. 77-9687

The high resolution magnetic sector atom probe was utilized to study the slow field evaporation of most of the transition metals in vacuum, in neon and in a mixture of neon and hydrogen to determine the occurrence of various metal-neon compound ions and the conditions favorable for their formation. Slow field evaporation and the presence of ambient hydrogen are established to be important for the formation of neides, with the experiments done at liquid nitrogen temperature. The metals studied were Ti, Fe, Ni, Cu, Zn, Zr, Nb, Mo, Rh, Pd, Ta, W, Re, Ir, Pt and Au. The metals that evaporate as metal neide ions abundantly are Ti, Zn, Zr, Nb, Mo, Pd and Ta, of which Ti, Nb and Pd produce neide ions as much as 80 to 90%, while the rest vary from 30 to 50%. Dissert. Abstr.

N77-30918 Catholic Univ. of America, Washington, D. C.
A KINETIC THEORY CALCULATION OF MICROWAVE BREAKDOWN CURVES FOR MOLECULAR NITROGEN Ph.D. Thesis
David F. Hudson 1977 148 p
Avail: Univ. Microfilms Order No. 77-11238

The electric field strength required to cause microwave breakdown in N2 was computed for three frequencies; 2.5, 10.0, and 24.1 GHz over the pressure range 1 to 600 torr. Comparison between the computed values and experimentally determined curves showed excellent agreement. A kinetic theory approach was used to determine the electron energy distribution function by numerically solving the Boltzmann transport equation. Breakdown curves were determined by balancing electron production (ionization) and electron loss (diffusion and recombination) processes. The distribution functions showed little dependence on the frequency and agreed with distribution functions computed by matrix inversion techniques for dc excitation. Dissert. Abstr.

N77-30919 Pennsylvania State Univ., University Park.
FIELD ION AND FIELD EMISSION MICROSCOPY OF GALLIUM, INDIUM AND TIN ON TUNGSTEN Ph.D. Thesis
Abdol-Reza Saadat 1976 160 p
Avail: Univ. Microfilms Order No. 77-9775

The deposit of Ga, In and Sn on a tungsten emitter tip and subsequent heating at 1,200 K results in a drastic change of the equilibrium shape of the emitter and the formation of the surface rearrangements. Occasionally, the covered tip heated above 1,200 K exhibited an entirely new cubic structure which would indicate the formation of the presently unknown ordered Sn-W and In-W alloys. The observed field strength required to deform a tin covered tungsten tip was found to be 2 to 3 times higher than gallium covered, indium covered or bare tungsten tips. The minimum closing voltage to cause damage on the metal surfaces of an electric contact was studied using the atomic resolution of the field ion microscope. Dissert. Abstr.

N77-30920 Pennsylvania State Univ., University Park.
A HIGH RESOLUTION SPECTROSCOPIC SYSTEM AND ITS APPLICATION TO THE INFRARED EMISSION SPECTRUM OF CARBON MONOXIDE Ph.D. Thesis
Terry Ray Todd 1976 146 p
Avail: Univ. Microfilms Order No. 77-9744

The achievable resolving power of a spectroscopic system which uses a 40 cm wide grating and combines a spectrograph and a spectrometer with a working range from 30 micron m to 3,000A was determined to be near perfect. The 1-0, 2-1, and 2-0 bands of C-12 O-16 were accurately calculated with respect to the known C-12 O-16 laser lines. Spontaneous emission sequences were measured for C-12 O-16, C-13 O-16, and C-12 O-18. Internally consistent sets of Dunham coefficients were calculated for the molecules from the best available data. Dissert. Abstr.

N77-30921*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
AN X-RAY FLUORESCENCE SPECTROMETER AND ITS APPLICATIONS IN MATERIALS STUDIES
Jag J. Singh and K. S. Han Aug. 1977 18 p
(NASA-TM-74062) Avail: NTIS HC A02/MF A01 CSCL 18H

An X-ray fluorescence system based on a Co(57) gamma-ray source has been developed. The system was used to calculate the atomic percentages of iron implanted in titanium targets. Measured intensities of Fe (k-alpha + k-beta) and Ti (k-alpha + k-beta) X-rays from the Fe-Ti targets are in good agreement with the calculated values based on photoelectric cross sections of Ti and Fe for the Co(57) gamma rays. Author

N77-30922# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Goettingen (West Germany).
THE CALCULATION OF FLOW FIELDS ABOUT THREE DIMENSIONAL BODIES IN HIGH ALTITUDE (FREE-MOLECULAR FLOW OF NEUTRAL ATOMS)
Walter Wuest 26 May 1975 69 p refs In GERMAN; ENGLISH summary Translation was announced as N76-27969
(DLR-FB-75-45) Avail: NTIS HC A04/MF A01; DFVLR, Goettingen DM 32.30

On bodies with single molecular reflection (plane walls or surfaces with convex curvature) in free molecular flow the local forces and the flow field can be calculated explicitely. On bodies with multiple molecular reflection (e.g. surfaces with concave curvature), where from one point of the surface another one can be seen, an interaction of the diffusely reflected molecules occurs, which is calculated for some simple shapes. Author

N77-30923# Giessen Univ. (West Germany). Abt. Angewandte Kernphysik.
THE DYNAMIC BEHAVIOR OF FAST NEUTRON PULSES AFTER PASSAGE THROUGH POLYETHYLENE AND IRON LAYERS [DAS DYNAMISCHE VERHALTEN VON IMPULSEN SCHNELLER NEUTRONEN NACH DURCHGANG DURCH POLYAETHYLEN- UND EISENSCHICHTEN]
H. Schneider, B. Richter, H. Engel, H. Flegel, and L. Hannappel Bonn DOKZENTBw 1977 36 p refs In GERMAN; ENGLISH summary Sponsored by Bundesmin. fuer Verteidigung
(BMVg-FBWT-77-1) Avail: NTIS HC A03/MF A01; DOKZENTBw DM 30

The shielding properties of polyethylene and iron and a mixture of both plates was studied by analyzing spectroscopically the dynamic behavior of fast neutron pulses (14 MeV, 0.8 ns) after passage through the plates. Energy and time of flight of the neutrons were measured between 3 and 15 MeV in steps of 2 MeV and between 0 and 12 ns time intervals in steps of 2 ns. For better comparison of the screening effects of the various material arrangements the neutron fluxes were converted into dose rates and then represented as a function of time between 0 and 12 ns. ESA

N77-30924# Loughborough Univ. of Technology (England). Dept. of Mathematics.
VARIATION-ITERATION SOLUTION OF THE HARTREE-FOCK EQUATIONS FOR ATOMIC SYSTEMS
M. Blakemore, G. A. Evans, and J. Hyslop Sep. 1976 20 p refs
(MATHS-Res-101) Avail: NTIS HC A02/MF A01

A recently proposed scheme based on the variation-iteration method was applied to the solution of the Hartree-Fock equations for atomic systems. The procedure depends on the repeated application of a Green's integral operator which involves a single numerical quadrature at each stage. The integrations are performed by means of a prescription described in a recent paper by the present authors and it is shown that the parallel philosophies of the self-consistent field and the variation-iteration approaches combine quite naturally. Representative calculations were carried out on three and four electron systems; first, the 1 S ground state of the beryllium atom corresponding to the configuration 1s2 2s2 and, second, the 2 S ground state of lithium was treated and the flexibility of the proposed scheme demonstrated by considering solutions of various forms of the SCF (Self Consistent Field) equation. Author (ESA)

N77-30925# Loughborough Univ. of Technology (England). Dept. of Mathematics.
ION TRAJECTORIES AND PROJECTION GEOMETRY IN THE FIELD-ION MICROSCOPE
R. Smith and J. M. Walls Mar. 1977 23 p refs
(MATHS-Res-109) Avail: NTIS HC A02/MF A01

Exact numerical computations are presented for the ion trajectories in the field-ion microscope for certain symmetric emitter shapes. Two mathematical models of emitter shape were used which yield exact solutions to Laplace equation for the electric potential, the first assuming the specimen a hyperboloid of revolution and the second a paraboloid of revolution, both with respect to cylindrical coordinates (y, 3). The computations illustrated the variation in the shapes of the ion trajectories as a function of several parameters. In all cases the curvature of the trajectory is small and varies slightly with the emitter geometry, and this explains why the point projection models have been successfully used to analyze micrographs. Results show that the projection is almost independent of emitter radius and tip to screen distance. ESA

73 NUCLEAR AND HIGH-ENERGY PHYSICS

Includes elementary and nuclear particles; and reactor theory.

For space radiation see *93 Space Radiation*.

N77-30926 Illinois Univ., Urbana-Champaign.
NUCLEAR PHYSICS AND DENSE MATTER Ph.D. Thesis
Frederick David Mackie 1976 205 p
Avail: Univ. Microfilms Order No. 77-9084

Several aspects of the liquid drop model and its applications are studied. The theory of surface tension as used in the liquid drop model is examined, and a refined version of the compressible liquid drop model, which redetermines semi-empirically the properties of bulk nuclear matter is developed. The resultant nuclear mass formula is applied to the equation of state of hot, dense matter. The concept of surface tension and consequences of relaxing the assumption that the surface tension of all nuclei is isotropic is studied. A macroscopic theory of anisotropic surface tension is presented and the theory is applied in the case of a uniformly charged liquid drop. It is shown that a small anisotropy in the surface tension can significantly distort a highly charged drop and lower its fission barrier without greatly affecting the total energy. Dissert. Abstr.

N77-30927 Indiana Univ., Bloomington.
STATISTICAL THEORY OF FISSION Ph.D. Thesis
Behrooz Compani-Tabrizi 1976 170 p
Avail: Univ. Microfilms Order No. 77-10918

The Wisskopf-Ewing-Newton and Ericson theory of fission was applied to binary spallation of O-16, Ne-20, and N-14 by protons in the proton energy range of 20-150 MeV, O-105 MeV, and O-41.9 MeV respectively. The incident proton capture cross section is calculated as well as the differential and total cross sections for binary fragmentation into near symmetric mass nuclei. The statistical theory is then reformulated to include the second law of thermodynamics and applied to neutron induced fission of plutonium 239, thorium 229, radium 226, and uranium 233 and 235. Dissert. Abstr.

N77-30928 Maryland Univ., College Park.
MEASUREMENT OF THE ANGULAR NEUTRON FLUX DISTRIBUTION IN A HIGHLY ABSORBING GASEOUS MIXTURE Ph.D. Thesis
Helmut Ernst Filacchione 1976 253 p
Avail: Univ. Microfilms Order No. 77-10270

The thermal angular neutron flux distribution was measured at 0 psig in a pure CO2-atmosphere and in a gaseous mixture of 50 percent BF3-50 percent CO2. The thermal absorption mean free path in the mixture was calculated to 90 cm. The experimental angluar flux distribution was compared with the angular distribution calculated by computer code which employs the method of discrete ordinates. Good agreement was found at distances larger than one third of the thermal absorption mean free path from the neutron source. Good agreement for source surface flux was found between the experimental results and the model for the assumption of an isotropic, radius-independent neutron source. Dissert. Abstr.

N77-30929 Maryland Univ., College Park.
THEORETICAL AND COMPUTATIONAL ANALYSIS OF TWO-GROUP INTEGRAL TRANSPORT EQUATION FOR FINITE SPHERICAL AND CYLINDRICAL MEDIA Ph.D. Thesis
Un Chul Lee 1976 195 p
Avail: Univ. Microfilms Order No. 77-10407

A two-group integral transport equation is reduced to a form which can be solved using the method of singular eigenfunction expansion. With application to both spherical and cylindrical geometries, this second order transform procedure is demonstrated to be equivalent to the more specialized first-order transform procedure applicable only to spherical problems. A numerical algorithm for the spherical shell-source problem is incorporated in a computer code. The total neutron densities, angular flux, net current and macroscopic neutron balance can be obtained from this computation. The accuracy of the code is investigated by a comparison of the total flux with the values obtained using a discrete ordinates code. Agreement was achieved to within the numerical accuracy of the model. The contribution to the density from the discrete and continuous eigenfunctions is shown separately. Dissert. Abstr.

N77-30930# Naval Postgraduate School, Monterey, Calif.
ELECTROEXCITATION OF THE T = 1 NUCLEUS Ni-58 AND THE J = 2 NUCLEUS Ni-60 UP TO 50 MeV EXCITATION M.S. Thesis
John Scott Beachy and Stephen Joseph Kowalick, Jr. Mar. 1977 147 p refs
(AD-A040200) Avail: NTIS HC A07/MF A01 CSCL 20/8

Giant multipole resonances and bound states in Ni58 and Ni60 were studied with inelastic scattering of electrons at 102 MeV incident energy and scattering angles of 45, 60, 75, 90, and 105 degrees. In the energy interval from 5 to 50 MeV excitation energy, eleven and thirteen states or resonances were observed in Ni58 and Ni60, respectively. Additionally, electroexcitation at low momentum transfer where the E1 cross section is predominantly excited shows a pronounced difference in cross section for Ni58 when compared to Ni60 and for (e,e:) as compared to photon experiments. GRA

N77-30931*# California Inst. of Tech., Pasadena. Div. of Chemistry and Chemical Engineering.
DOUBLE RESONANCE INTERFEROMETRY: RELAXATION TIMES FOR DIPOLAR FORBIDDEN TRANSITIONS AND OFF-RESONANCE EFFECTS IN AN AX SPIN SYSTEM Interim Report
M. E. Stoll, A. J. Vega, and R. W. Vaughan Apr. 1977 43 p refs Submitted for publication
(Grant NsG-7275; Contract N00014-75-C-0960)
(NASA-CR-154848; AD-A040421; TR-6) Avail: NTIS HC A03/MF A01 CSCL 20/8

Experimental and theoretical results of a nuclear magnetic double resonance interferometric study of a model AX spin system are presented. Measurements of the characteristic relaxation times of off-diagonal density matrix elements corresponding to magnetic-dipole-forbidden transitions are presented, and the use of such relaxation time constants to obtain information including cross-correlations of the fluctuating fields at the A and X nuclear sites is discussed. Author (GRA)

N77-30932# Naval Research Lab., Washington, D. C.
USE OF AN INTRINSIC GERMANIUM DETECTOR ARRAY FOR AN AERIAL SURVEY OF SURFACE NUCLEAR RADIATION Final Report, Mar. - Jun. 1976
Keith W. Marlow and Gary W. Phillips Feb. 1977 33 p refs
(Contract E(05-1)1670)
(AD-A038418; NRL-MR-3452) Avail: NTIS HC A03/MF A01 CSCL 20/8

This report describes the results of an experiment to measure the natural gamma radiation emitted from the earth's surface with the aid of radiation detectors mounted in an aircraft. For

comparison, two detector systems were used: an array of intrinsic germanium detectors with a total active volume of 0.4 liter and a single NaI(Tl) scintillation detector 30.5 cm diam X 30.5 cm long. Data were recorded on flights at altitudes of 60, 120, 240, 300 and 5,100 meters and with average airspeed of 200 knots. A discussion is presented on the application of germanium detectors to the atmospheric radon problem; in particular, on the use of the photons with energy 295, 352 and 609 keV to determine the respective contributions from the air and the surface. GRA

74 OPTICS

Includes light phenomena.

N77-30933 Purdue Univ., Lafayette, Ind.
ANALYTICAL AND EXPERIMENTAL DESIGN AND ANALYSIS OF AN OPTIMAL PROCESSOR FOR IMAGE REGISTRATION Ph.D. Thesis
Martin Svedlow 1976 181 p
Avail: Univ. Microfilms Order No. 77-7534

The registration of temporally differing images is defined in a way that allows its analysis via parameter estimation theory. Assuming spatial congruence between the images, one image is defined as the signal and the second image is assumed to be the signal plus additive noise, where the noise is comprised of the temporal changes and any additional noise introduced by the sensor system. The parameters to be estimated are the relative translations between the images. With this formulation, a quantitative measure of the performance of the registration processor is defined and an optimum processor that yields the best possible performance in terms of the criteria chosen is derived. Dissert. Abstr.

N77-30934 Maryland Univ., College Park.
GENERATION OF SPECTRALLY TUNABLE LIGHT PULSES IN THE PICOSECOND DOMAIN WITH APPLICATIONS TO SPECTROSCOPY Ph.D. Thesis
Terry Robert Royt 1976 163 p
Avail: Univ. Microfilms Order No. 77-10419

A source was constructed that provided two independent, freely tunable, modelocked pulses with known and adjustable degrees of temporal overlap. Using the the same modelocked pump to drive two synchronously modelocked dye lasers, two independently tunable trains of pulses were formed whose pulses were synchronized in time. The utility of the synchronous technique for picosecond pulse nonlinear studies use, was demonstrated by a 3- and 4-wave sum frequency generation to generate tunable picosecond pulses in the near UV and the vacuum UV. The tunable VUV was used to study the character of the 5s(2)4d6p autoionizing resonance of Sr. A demonstration of the capability of two synchronously modelocked dye lasers, and one which makes use of the ability to delay one pulse with respect to the other, was the measurement of the lifetime of a two-quantum excited coherent state of Sr. Dissert. Abstr.

N77-30935*# National Aeronautics and Space Administration. Goddard Inst. for Space Studies, New York.
PARTIAL POLARIZER FILTER Patent Application
Alan M. Title, inventor (to NASA) (LMSC, Sunnyvale, Calif.) Filed 11 Aug. 1977 18 p Sponsored by NASA
(NASA-Case-GSC-12225-1; US-Patent-Appl-SN-823566) Avail: NTIS HC A02/MF A01 CSCL 20F

A birefringent filter was developed which contains, in seriatum, an entrance polarizer, a first birefringent crystal, a partial polarizer, a second birefringent crystal, and an exit polarizer. The first and second birefringent crystals have fast axes disposed + or - 45 deg from the high transmitivity direction of the partial polarizer. Preferably, the second crystal has a length half that of the first crystal and the high transmitivity direction of the partial polarizer is nine times as great as the low transmitivity direction. To provide tuning, the polarizations of the energy entering the first crystal and leaving the second crystal are varied by either rotating the entrance and exit polarizers, or by sandwiching the entrance and exit polarizers between pairs of half wave plates that are rotated relative to the polarizers. A plurality of the filter modules may be cascaded. NASA

N77-30936# University of Southern Calif., Los Angeles. Image Processing Inst.
IMAGE PROCESSING RESEARCH Semiannual Technical Report, 1 Oct. 1976 - 31 Mar. 1977
Harry C. Andrews 31 Mar. 1977 202 p refs
(Contract F33615-76-C-1203; ARPA Order 3119)
(AD-A039035; USCIPI-740) Avail: NTIS HC A10/MF A01 CSCL 17/8

This technical report summarizes the image understanding and image processing research activities performed by the Image Processing Institute at the University of Southern California. The research program has as its primary purpose the development of techniques and systems for processing, transmitting and analyzing images and two dimensional data arrays. Six tasks are reported: Image Understanding Projects; Image Processing Projects; Smart Sensor Projects; Institute Facilities Projects; Recent Ph.D. Dissertations and Recent Institute Personnel Publications. GRA

N77-30937# Honeywell, Inc., Minneapolis, Minn. Systems and Research Div.
ADVANCED HELMET SIGHT RETICLE ASSEMBLY (AHRA) Final Report, May 1970 - Feb. 1972
Patrick D. Pratt Jul. 1976 361 p refs
(Contract F33615-70-C-1655; AF Proj. 7184)
(AD-A039057; AMRL-TR-73-11) Avail: NTIS HC A16/MF A01 CSCL 20/6

This report describes the research and development of a 19-month program to develop a helmet display technique that uses the helmet visor as the last optical element in the system. Five techniques were explored for projecting reticle and video imagery without any optical element between the eye and the helmet visor. The single reflecting parabolic approach was selected for fabrication of a prototype helmet mounted visor reticle projection assembly. To complete this design it was necessary to develop parabolic visor fabrication techniques, a miniature lamp, and a thin film dielectric coating for plexiglas visors. It was also recognized early in the program that the double-reflecting symmetrical parabolic visor was the best approach for video projection. The special optical conditions obtained with the symmetrical parabolic approach are the reduction of astigmatism and cancellation of coma. This permits the use of a simple triplet design for the collimation optics which project collimated light to the parabolic visor. This permits a compact helmet mounted assembly. A fiber optic bundle and relay optics are used to relay video information from a 1-inch CRT mounted at the back of the helmet to the collimation optics. This design approach resulted in a reliable prototype that was assembled and delivered on February 15, 1972. Author (GRA)

N77-30938# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Electrical Engineering.
THIN-FILM ACOUSTO-OPTIC SURFACE WAVE INTERACTIONS AND DEVICES Final Report, 1 May 1973 - 30 Jun. 1976
Chen S. Tsai Aug. 1976 122 p refs
(Contract N00014-75-C-0948)
(AD-A039659) Avail: NTIS HC A06/MF A01 CSCL 09/5

Studied was the diffraction pattern and its electronic scanning of the resultant acoustic beam from plane and stepped array transducers. The results show that for a limited angular scan the diffraction patterns and their phase and frequency scanning may be described, to a large degree, in terms of the phased-and frequency-scanning array antenna theory with some modifications. Some applications with both types of array transducers are described. In particular, the stepped array transducer is shown to have several immediate applications in connection with wideband guided-light beam deflection. GRA

N77-30939# Westinghouse Defense and Electronic Systems Center, Baltimore, Md. Systems Development Div.
DEMONSTRATION OF WESTINGHOUSE AUTOMATIC CUEING TECHNIQUES USING NVL IMAGERY Final Report
G. E. Tisdale and T. P. Truitt 23 May 1976 91 p refs

(Contract DAAG53-75-C-0225)
(AD-A036538) Avail: NTIS HC A05/MF A01 CSCL 17/5

This report describes the work and results of a study to establish the performance of existing digital image processing techniques on FLIR imagery supplied by NVL. The image processor would form the basis for an automatic target cueing system to assist the human operator of a sensor system. The study consisted of a statistical test, performed by computer simulation, including training and test phases. The target classes include truck, tank, and APC. Initial detection of targets scored in the 90% range. Depending upon image quality, the classification performance was in the 60% to 80% range. Using the same sensitivity setting, the false alarm rate was 20%. The exact setting, trading false alarm rate for detection rate would depend upon the mission requirements. It was noted that the number of samples was very limited, in view of the number of features used. Future efforts might include a larger data base. It was also suggested that the design of a compact automatic cueing system breadboard be started to keep pace with sensor hardware development.
Author (GRA)

N77-30940# Naval Electronics Lab. Center, San Diego, Calif.
FIBER OPTICS APPLICATIONS IN THE SHIPBOARD DATA MULTIPLEX SYSTEM. DEVELOPMENTAL FIBER OPTIC COMPONENTS COULD REPLACE COAXIAL ELECTRICAL DATA BUSSES, TO IMMUNIZE THE SDMS FROM EFFECTS OF SHIPBOARD ELECTROMAGNETIC INTERFERENCE Final Report, Nov. 1975 - Jun. 1976
D. E. Altman Aug. 1976 63 p refs
(SF21224401)
(AD-A039505; NELC/TR-1995) Avail: NTIS HC A04/MF A01 CSCL 17/2

For a nominal size Shipboard Data Multiplex System (eight area multiplexers) using a passive tee coupler configuration, the connector and coupler excess losses for each coupler must total no more than 1.8 dB, which appears to be well within the state of the art. For a maximum size system (sixteen area multiplexers) the per coupler losses must be reduced to about 0.5 dB or less, which probably can be achieved given sufficient development effort. Two other devices, the passive star coupler and the fail-safe active tee coupler, also appear to have development potential for use in both nominal and maximum size systems.
Author (GRA)

N77-30941# ARO, Inc., Arnold Air Force Station, Tenn.
ELECTRO-OPTICAL TECHNIQUES FOR DIESEL ENGINE RESEARCH Final Report, Sep. 1971 - Jun. 1975
A. E. Lennert, R. E. Sowls, R. A. Belz, W. H. Goethert, H. T. Bentley, H. M. Powell, A. B. Bailey, and T. D. McCay AEDC May 1977 164 p refs
(ARO Proj. B34S-04A)
(AD-A039357; ARO-OMD-TR-76-145; AEDC-TR-77-17) Avail: NTIS HC A08/MF A01 CSCL 20/6

The results of research to determine the feasibility of applying electro-optical diagnostic techniques to the study of combustion phenomena in diesel engines is described and evaluated. The techniques that were investigated included: high-speed laser-augmented photography, holography, fringe techniques (laser anemometry and particle sizing), mass spectroscopy, and resonance absorption. A conventional Army TACOM diesel engine and a Turner engine were modified to acquire optical access by installing quartz windows in the combustion chamber. Droplet formation, breakup, combustion, and flow phenomena were observed in the combustion chamber in three dimensions using holographic techniques, whereas conventional high-speed photography provided only information in a plane. It was established that two-dimensional velocity measurements can readily be made in the combustion chamber but that additional development is required on the prototype particle-sizing instrument. The formation of certain hydrocarbones was observed in real time using resonance absorption techniques with a narrow-line, tunable helium-neon laser. Species determination, including total temperature, was realized with the application of mass spectroscopy.
Author (GRA)

N77-30942# Xonics, Inc., Santa Monica, Calif.
THEORETICAL STUDIES OF HIGH-POWER ULTRAVIOLET AND INFRARED MATERIALS Technical Report, 1 Jul. - 31 Dec. 1976
M. Sparks and C. J. Duthler 31 Dec. 1976 338 p refs
(Contract DAHC15-73-C-0127)
(AD-A040596; TR-8) Avail: NTIS HC A15/MF A01 CSCL 20/5

The expected performance of high power reflectors and windows for use in the 250 to 350nm wavelength region was studied. Topics discussed include: optical distortion and failure in high power reflectors; thermal stresses and expansion in multilayer transparent materials; failure thresholds of near ultraviolet transparent materials; laser-induced electron avalanches in insulating solids; and materials for high-power visible and ultraviolet lasers.
A.R.H.

N77-30943# Philips Labs., Briarcliff Manor, New York.
DEVELOPMENT OF AN OPTICAL DISC RECORDER Quarterly Technical Report, 1 Jan. - 31 Mar. 1977
George Kenney, F. Zernike, D. Lou, M. Giebler, A. Milch, J. Wagner, A. Chan, and R. McFarlane Apr. 1977 46 p
(Contract N00014-76-C-0441; ARPA Order 3080)
(AD-A040659) Avail: NTIS HC A03/MF A01 CSCL 14/3

Twenty tellurium air sandwiches were assembled in a new dedicated clean room. Preliminary tests of the sandwiches indicate acceptable characteristics for digital recording. The recorder prototype is now operational. The Philips Research Laboratories (PRL) recorder has been used for routine materials evaluation. No degradation of tellurium films has been observed after 3,000 hours at 90 C. The backup turntable and sled assembled from commercially available components were tested and found acceptable for digital recording applications. The tasks of data modulation and error encoding/decoding are proceeding well.
Author (GRA)

N77-30944# Calspan Corp., Buffalo, N. Y.
DATA COLLECTION AND MODELING OF IN-FLIGHT INTRINSIC CONTRASTS OF AIRCRAFT Final Report
Harry B. Hammill May 1977 48 p refs
(Contract DAAK40-75-C-1114)
(AD-A040165; CALSPAN-SK-5753-D-1; DRDMI-TD-CR-77-1) Avail: NTIS HC A03/MF A01 CSCL 17/8

Mathematical modeling to predict the ability of a human observer to visually search and detect aircraft against a sky background requires luminous contrast as an input parameter. This, in turn, depends on average luminance of the aircraft silhouette and its relation to sun angle. The purpose of the reported study was to test the diffuse (Lambertian) reflecting sphere as a model for introducing illumination geometry, principally the solar phase angle, into the prediction of aircraft luminance. The test consisted of a comparison of model prediction with field test data consisting of photographic imagery of low-altitude aircraft. The photographic data were reduced through two-dimensional scanning densitometry to yield mean silhouette luminance. These values were compared to values predicted by a diffuse sphere model with the comparison including a full account of atmospherics. A discussion of the comparison is included.
Author (GRA)

N77-30945# ITT Electro-Optical Products Div., Roanoke, Va.
LOW COST FIBER OPTIC CABLE ASSEMBLIES FOR LOCAL DISTRIBUTION SYSTEMS Final Report, 1 May 1975 - 1 Oct. 1976
R. J. Freiburger Apr. 1977 152 p refs
(Contract DAAB07-75-C-1328)
(AD-A040717; ECOM-75-1328-F) Avail: NTIS HC A08/MF A01 CSCL 17/2

This report describes the results of a one year effort to develop a low cost fiber optic cable using plastic clad silica fibers. As part of the program, silica core and plastic cladding materials were evaluated with respect to optical attenuation, mechanical properties, chemical properties, and radiation hardness. Fabrication techniques were developed and means to minimize excess cable loss evaluated. Uncabled fibers were fabricated with attenuations as low as 5.5 db/km at .79 micrometers. Three cable designs were developed; one with central strength members, one with external strength members, and one with central strength members and an external braid. These designs, though developed for plastic clad silica fibers, are well suited to use with low loss doped silica fibers as well. The cables were

fabricated in two phases. In the first phase, short lengths (1/3 km) of the three designs were fabricated and subjected to optical and mechanical evaluations. Based on the results of these tests, the third design was eliminated since it was more costly and offered no advantages over other designs. In the second phase, final cable models of the central strength member and the external strength member designs were fabricated in lengths from 1/3 km to 1 km. The final models were subjected to optical, mechanical, environmental, and radiation evaluations. The cables met or exceeded most of the program goals. GRA

N77-30946# Bendix Corp., Kansas City, Mo.
ANGULAR DISTRIBUTION OF DIFFUSE LIGHT REFLECTED FROM ISOLATED DEFECTS ON SUPERFINISHED SPHERES
P. E. Klingsporn Feb. 1977 27 p ref
(Contract EY-76-C-04-0613)
(BDX-613-1363(Rev)) Avail: NTIS HC A03/MF A01

A special array of light pipes was constructed and used with a photodetector to measure the angular distribution of light reflected diffusely from small isolated defects on superfinished nickel spheres. Defects in a size range of concern were detected by the system, and angular distributions of the diffuse light generated by the defects correlated with the defect dimensions. ERA

N77-30947# Bendix Corp., Kansas City, Mo.
OPTICAL SYSTEM FOR AUTOMATED INSPECTION OF HIGHLY REFLECTIVE SPHERICAL SURFACES
P. E. Klingsporn Feb. 1977 68 p refs
(Contract EY-76-C-04-0613)
(BDX-613-1497) Avail: NTIS HC A04/MF A01

An optical system was designed for use in automated inspection of superfinished spherical surfaces. Helium neon laser light is used to illuminate a small region on the spherical surface, and the light reflected from the surface is focused to a point on the face of a photodetector array capable of measuring light intensity as a function of both radial and angular coordinates. When an isolated defect such as a pit or scratch is illuminated, a characteristic diffraction pattern, centered about the focused spot, is observed in the plane of the detector array. Theoretical relations were derived which relate the intensities and sizes of the defect diffraction patterns to the type and dimensions of the isolated defect. The latter relations are important for determining defect sizes from photodetector measurements of the diffraction pattern intensities and thereby establishing surface quality certification criteria. ERA

N77-30948# Officine Galileo S.p.A., Florence (Italy).
FAN BEAM ALBEDO SENSOR UNIT ENGINEERING MODEL Final Report
R. Bencivenni Mar. 1977 72 p refs
(Contract ESTEC-2421/75-AK)
(ESA-CR(P)-947) Avail: NTIS HC A04/MF A01

A fan beam albedo sensor unit engineering model was developed. The optical head, mechanical configuration, the electronic block diagram are described. In-process, optical electrical and functional tests are presented. The optical head of the sensor consists of an afocal wide angle anamorphic unit with cylindrical lenses, a conventional optical collector, a detector equipped with a suitably shaped slit for delimiting the field of view at the requested angular value. ESA

N77-30949# Michigan Univ., Ann Arbor. Cooley Electronics Lab.
DETECTION OF TEMPORALLY COHERENT LIGHT AT LOW SIGNAL LEVELS
W. B. Ribbens Jan. 1977 74 p refs
(Grant DAHC04-75-G-0165)
(AD-A039818; ARO-13271.1-P) Avail: NTIS HC A04/MF A01 CSCL 17/8

The objective of this study program has been to study methods of detection of coherent or partially coherent optical radiation in a noncoherent background. This study is primarily intended for application at low light levels and low ratios of coherent to noncoherent (i.e., signal/noise) light. This study has application for identifying/locating a source of partially coherent light (e.g., laser) in daylight or in the presence of thermal background radiation. Essentially this measurement method is based upon measurements of temporal coherence of received light. The background light is almost totally noncoherent. Laser radiation is partially coherent, and can, in certain cases approach total coherence. Author (GRA)

N77-30950# Sperry Rand Research Center, Sudbury, Mass.
MULTIPLEXING AND FILTERING OF OPTICAL SIGNALS Semiannual Report, 29 Apr. - 31 Oct. 1976
Arthur R. Nelson Dec. 1976 50 p refs
(Contract DAAB07-76-C-1343)
(AD-A040068; SCRC-CR-76-65; ECOM-1343-1) Avail: NTIS HC A03/MF A01 CSCL 20/6

The objective of this contract is to develop an optical multiplexing device to combine onto one channel the information carried on several separate fiber optic channels and, subsequently, to perform the demultiplexing operation after transmission over distances of the order of a km. The main research effort is the development of the optical multiplexing/demultiplexing device. This device must be compatible with multimode fibers of relatively large numerical aperture, exibit total throughput losses less than 15 db, total signal to crosstalk ratio of more than 20 db, and a bandwidth capability of 1.3 MHz. This report covers the work performed during the first six months of this contract, from May through October 1976. During this period the required work on the multiplexer device was nearly completed, and at this point all but one of the criteria outlined above have been met. Specifically, several devices which have throughput losses of 10-15 db, are capable of working with large NA fibers, and have bandwidths of 100 MHz, have been constructed. At this time only one requirement has not been fully met; that is, 10 db signal to crosstalk has been obtained as opposed to 20 db. However, several new devices, which are near completion, have been designed to improve the results in this area. GRA

N77-30951# Hughes Research Labs., Malibu, Calif.
DEVELOPMENT OF A COLOR SYMBOLOGY ac LIQUID CRYSTAL LIGHT VALVE Final Technical Report, 1 Nov. 1974 - 12 Jun. 1976
A. D. Jacobson and W. P. Bleha Apr. 1977 105 p refs
(Contract N00024-75-C-7187)
(AD-A039118) Avail: NTIS HC A05/MF A01 CSCL 20/6

The development of a reflective mode liquid crystal light valve suitable for large screen dynamic color symbology projection display is described. The light valve consists of a sandwich structure of a thin film photoconductor, light blocking layer, broad visible spectrum dielectric mirror and liquid crystal sandwiched between two glass electrodes with transparent conductive electrodes. There are no matrix elements to define resolution; because of the insulating characteristics of the dielectric mirror it is necessary to use ac voltages to operate the light valve. The report details the development of the ac light valve with two liquid crystal modes; tilted perpendicular, birefringent field effect and hybrid field effect (HFE). The development of the light valve proceeded in two phases. The first phase concentrated on the tilted perpendicular device. The development of liquid crystals and alignment techniques, CdS photoconductor development, dielectric mirror fabrication, and light valve device physics are detailed here. Also reported are substrate uniformity and cosmetic quality improvements, and a new cell holder design. Finally, the performance of the two tilted perpendicular light valves, delivered to the Naval Electronics Laboratory Center, San Diego, California, is described. The second phase continued the work of the first phase but concentrated on the HFE light valve. The application of the HFE mode to color symbology is described. Finally, at the end of this phase the performance of the HFE color symbology light valve that was the final device delivery to NELC is detailed. GRA

N77-30952# McDonnell Aircraft Co., St. Louis, Mo.
FOVEAL LENS SIZE REDUCTION STUDY Final Report, Jun. - Nov. 1975
Ralph W. Fisher, Ralph W. Fisher, and Roger D. Helmick Apr. 1976 90 p
(Contract F33615-75-C-1294)
(AD-A039896; AFAL-TR-76-6) Avail: NTIS HC A05/MF A01 CSCL 20/6

Technical feasibility is established of miniaturizing the MCAIR

nonlinear of foveal lens. The original lens fabricated under a Navy contract proved to be too large and heavy for USAF applications. Theoretical limits of miniaturization are developed by establishing preliminary optical designs for lenses with progressively smaller clear aperture diameter and comparing performance with system requirements. The results show that a 50% size reduction is possible with no loss in optical performance. The resulting 4 inch diameter F/3 lens can be fabricated of either glass or plastic optical materials. Optical performance of the lens is such that it can support up to 4x magnification of its image to achieve a zoom capability that is desirable for detailed target identification. Further size reduction to a 2 inch diameter is shown to be technically feasible but with a penalty of less resolution of higher F/number. The former will limit zoom magnification possible, while the latter will reduce daylight operating time. A higher technical risk is associated with this level of miniaturization. Author (GRA)

N77-30953# General Electric Co., Syracuse, N.Y. Optoelectronic Systems Operation.
CONTINUED DEVELOPMENT OF INDIUM ANTIMONIDE CID ARRAYS Final Report, Oct. 1975 - Oct. 1976
J. C. Kim, W. E. Davern, and D. Colangelo May 1977 115 p refs
(Contract N00173-76-C-0128)
(AD-A039990) Avail: NTIS HC A06/MF A01 CSCL 17/5

Two-dimensional 16x24 InSb CID area arrays have been designed and successfully fabricated via a multilayer MIS processing technique. The operation of these arrays in a staring mode has been demonstrated by displaying real time raster-scanned IR images on an X-Y CRT monitor. The raw video image displays were as sharp as the actual objects, being clearly recognizable with no sign of blooming and, therefore, excellent operating characteristic. Theoretical analysis showed that at low sample rates, a background limited performance (BLIP) can be obtained at background photon flux levels of as low as mid-10 to the 12th power photons/sec-sq cm. The dominant noise source, in this case, is the integrated dark current shot noise. For operation at high sample rates, however, the bandwidth-dependent noise sources limit the array performance and, thus, BLIP occurs at higher background levels. The analysis has been confirmed by measured data on line arrays, resulting in good agreement between the theoretical curve and the experimental data.
Author (GRA)

75 PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion.
For ionospheric plasmas see *46 Geophysics*. For space plasmas see *90 Astrophysics*.

N77-30954 Texas Univ., Austin.
MICROINSTABILITY THEORY OF THE TWO-ENERGY COMPONENT FUSION PLASMA SYSTEM Ph.D. Thesis
Liang-Peng Mai 1976 147 p
Avail: Univ. Microfilms Order No. 77-3946

The stability theory for the two-component system is developed from the Vlasov-Maxwell equations. Several modes of microinstability which are associated with neutral beam injection of alpha particle production in fusion reactions are studied using three different models for the fast ion distributions. First, the fast ion distribution function arising from neutral beam injection is found from solutions of the Fokker-Planck equation. It is found that for pulsed parallel injection, the l = -1 ion cyclotron mode has a low threshold density due to TB/E sub b anisotropy. However, anomalous scattering of the wave is shown to enhance the diffusion of the fast ions in the upsilon sub perpendicular - direction, which will stabilize the system in a small fraction of the slowing down time when l = -1 mode is dominant. The second form of the fast ion distribution arising from parallel and anti-parallel injections is modified by a counterstreaming Bi-Maxwellian and it is shown that the left-handed circularly polarized mode has negligible thermal ion and electron damping effects. Dissert. Abstr.

N77-30955 Illinois Univ., Urbana-Champaign.
ION BUNCHING IN ELECTRONIC SPACE CHARGE REGIONS Ph.D. Thesis
Wayne Lee Johnson 1976 62 p
Avail: Univ. Microfilms Order No. 77-9041

A candidate for the initiation of a pellet fusion microexplosion is ions, but the power level from existing sources is far below the calculated value. Electron beam energy can be converted to ion motion with high efficiency, but even the largest E-beam in existence is still below the required power level by two orders of magnitude. If the ions are bunched in their arrival at the target, the instantaneous power delivered to the target can be much larger than the terminal value. Theoretical calculations show that the power, time scale, and energy requirements for pellet fusion can be met with modifications of existing E-beam sources. It is shown that energy can be transferred from an electron beam to plasma ions and that resulting space charge neutralized ion pulse can be compressed in time. It also demonstrated transient interactions between the electron beam and the background plasma. Dissert. Abstr.

N77-30956 Princeton Univ., N. J.
TRANSPORT OF INJECTED IMPURTIES IN THE ATC TOKAMAK Ph.D. Thesis
Earl S. Mamar 1977 129 p
Avail: Univ. Microfilms Order No. 77-9982

A system to inject intense, short bursts of energetic metal atoms was installed on the Tokamak, and used to study the temporal and spatial evolutions of the densities of various charge states of aluminum and scandium, from the edge of the plasma into the center of the discharge. The results are completely consistant with neoclassical theory predictions for impurity transport in the discharge. The presence of the 'inward' neoclassical-type terms in the impurity particle flux is confirmed. Results of an experiment measuring the scaling of transport rates near the edge of the plasma with changing toroidal current, indicate that these transport rates are proportional to the square of the safety factor. When taken as a whole, the results imply that any anomalous diffusion of the injected impurities is at most of the same size as the neoclassical, and certainly does not dominate the transport. It appears that once an impurity reaches the center of the ATC plasma in trace amounts, it is confined for times at least as great as 20 msec. Dissert. Abstr.

N77-30957 Tennessee Univ., Knoxville.
RESISTIVE INSTABILITIES IN TOKAMAKS Ph.D. Thesis
Carl Monroe Copenhaver 1976 153 p
Avail: Univ. Microfilms Order No. 77-10760

The influence of resistivity on the magnetohydrodynamic (MHD) stability of the Tokamak and of a diffuse linear pinch is investigated. Ideal MHD instabilities of axisymmetric toroidal equilibria with circular cross section are investigated and it is found that toroidal effects can stabilize both the kink and interchange modes. A two region model and associated computer program are developed. The two regions, according to the eigenfunction approximations used, are: an ideal MHD region that employs a cylindrical approximation modified with toroidal corrections and a thin resistive layer region. Results show that toroidal effects can stabilize the resistive interchange and tearing modes for safety factors greater than one. It is also found that it is not correct to use stability parameters calculated for tearing modes in the analysis of overstable modes. Dissert. Abstr.

N77-30958 Wisconsin Univ., Madison.
ION HEATING AT THE CYCLOTRON RESONANCE IN PLASMAS MAGNETICALLY CONFINED IN A TOROIDAL OCTUPOLE FIELD Ph.D. Thesis
James Duncan Barter 1976 173 p
Avail: Univ. Microfilms Order No. 77-6592

Ion temperatures as high as 600 eV were produced using RF wave heating at the ion cyclotron resonance frequency in a toroidal octupole magnetic field. RF is coupled to the plasma with an externally driven fifth hoop which forms the inductive leg of an oscillator tank circuit. Power levels up to 1 MW at 1 to 3 MHz have been applied for periods up to 2 msec. Plasmas produced either by cyclotron resonance heating or by gun injection were simulated with a computer program in which known particle and energy production and loss mechanisms are used to predict

the spatially averaged time behavior of the plasma in the presence of the applied ion heating. Results of the program were then compared to experimental data for the same parameters. The program can thus be used to calculate the consequences of the heating model in the presence of many cooling mechanisms which may have a separate dependence on instantaneous plasma paremeters. Dissert. Abstr.

N77-30959 Harvard Univ., Cambridge, Mass.
WAVES AND INSTABILITIES IN PLASMAS IN PULSAR ATMOSPHERES Ph.D. Thesis
Marlene Rosenberg 1976 236 p
Avail: Univ. Microfilms Order No. 77-11194

A plasma is characterized by a large ratio of gyrofrequency, omega x beta, to plasma frequency, omega sub zero, in order to provide a foundation for the evaluation of recent theoretical models of pulsars. The model is a cold electron-positron plasma of density 2n sub 0 in a strong uniform magnetic field, through which a low density, monoenergetic relativistic beam of energy streams along the field. The collective mode structure of the cold plasma is analyzed. Linearly polarized modes are eigenoscillations for parallel propagation, and there is a purely transverse, linearly polarized mode whose properties are independent of the angle of propagation. The Cerenkov and cyclotron beam-plasma instabilities are investigated analytically for all angles of propagation. Instabilities occur in two frequency bands; at low frequencies (omega less than or equal to nu sub 2 x omega sub zero) and at high frequencies (omega approx. equal to omega x beta).
Dissert. Abstr.

N77-30960 Cornell Univ., New York.
THOMSON SCATTERING AND DIAMAGNET LOOP STUDIES OF A RELATIVISTIC ELECTRON BEAM-HEATED PLASMA Ph.D. Thesis
John Dasho Sethian 1976 276 p
Avail: Univ. Microfilms Order No. 77-11012

The plasma heating resulting from the interaction of a relativistic electron beam and a pre-ionized plasma column confined in hard vacuum by a 2:1 magnetic mirror field was investigated to determine the mechanism by which electron beam energy is coupled to plasma perpendicular energy, and the partitioning of this plasma perpendicular energy among the plasma species with time after electron beam injection. In applying the experimental results to the return current heating model, it was found that 20% of the observed plasma perpendicular energy could be due to excitation of the Buneman two-stream interaction. Dissert. Abstr.

N77-30961 Iowa State Univ. of Science and Technology, Ames.
INVESTIGATIONS OF SEVERAL INTERFERENCE EFFECTS IN HIGH FREQUENCY PLASMAS OF ANALYTICAL IMPORTANCE Ph.D. Thesis
George Frederic Larson 1976 139 p
Avail: Univ. Microfilms Order No. 77-10325

For an RF-excited inductively coupled plasma (ICP) it was shown that: (a) two solute vaporization interferences often observed in flames are eliminated or reduced to negligible proportions in the plasma; (b) increasing concentrations of an easily ionizable (Na) up to concentrations of 6900 micrograms/ml exerted an unusually low influence on the observed emission intensities of three selected elements (Ca, Cr, and Cd) of widely differing degrees of ionization. The high degree of freedom from interelement effects of this analytical technique is further documented by the observation that a variety of matrices did not affect the emission intensity of Mo to a significant extent. Severe interference effects observed in the microwave-excited single electrode plasma are small or negligible in the ICP.
Dissert. Abstr.

N77-30962 Iowa State Univ. of Science and Technology, Ames.
STUDY OF A RADIO FREQUENCY EXCITED ARGON PLASMA IN A CATHODIC SPUTTERING SYSTEM Ph.D. Thesis
Charlie Louis Tolliver 1976 210 p
Avail: Univ. Microfilms Order No. 77-10344

The Langmuir static probe constructed measurements of electron density and electron temperature are made for the argon plasma used in the RF excited dc cathodic sputtering system for the purpose of thin-film deposition. The argon plasma is subject to an axial static magnetic field provided by the Helmholtz coils. The plasma is regarded as a conducting fluid which is characterized by the conductivity tensor of a uniform unbounded plasma. The conductivity tensor is derived and the effect of static magnetic flux density upon the conductivity tensor is examined. Applying the concept of equivalent load impedance, a method of analysis is developed for the RF power supplied to the plasma via a loop antenna radiating at a frequency of 27 MHz. The expressions of radiation resistance and antenna reactance are derived in the integral form, and the self-inductance of RF current loop is derived approximately with the aid of elementary electromagnetic field theory. Dissert. Abstr.

N77-30963# Naval Research Lab., Washington, D. C. Plasma Dynamics Branch.
TWO-DIMENSIONAL FLUID SIMULATION OF RELATIVISTIC ELECTRON BEAM-HIGH Z TARGET INTERACTIONS Interim Report
D. G. Colombant and D. Mosher May 1977 25 p refs
(NRL Proj. H02-26K)
(AD-A040090; NRL-MR-3496) Avail: NTIS HC A02/MF A01 CSCL 20/9

A two-dimensional r-z fluid code has been developed to study the interaction between a relativistic electron beam and an anode plasma. A self-consistent treatment of the electromagnetic fields has been included. Radial pinching of the beam is observed when its self-field resistively diffuses into the plasma.
Author (GRA)

N77-30964# Naval Research Lab., Washington, D. C.
SHEAR STABILIZATION OF DRIFT WAVES IN NONCIRCULAR CROSS SECTION AXISYMMETRIC CONFIGURATIONS
Edward Ott (Cornell Univ.), Wallace M. Manheimer, and K. R. Chu (Sci. Appl., Inc., McLean, Va.) May 1977 22 p refs
(Contract AT(49-20))
(AD-A040748; NRL-MR-3516) Avail: NTIS HC A02/MF A01 CSCL 18/12

A calculation is given of the shear induced damping of drift waves for noncircular cross section axisymmetric devices in the electrostatic approximation. Comparison of damping rates for circular and elliptical cross section Tokamaks shows only a weak dependence on the ellipticity. Author (GRA)

76 SOLID-STATE PHYSICS

Includes superconductivity.

For related information, see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers.*

N77-30965 South Carolina Univ., Columbia.
AN ELECTRON SPIN RESONANCE STUDY OF SOME TRANSITION METAL PORPHYRINS Ph.D. Thesis
Carl Oliver Clark 1976 155 p
Avail: Univ. Microfilms Order No. 77-6751

An electron spin resonance study was made of some copper (II), iron (III) and manganese (II) tetraphenyl porphyrins magnetically diluted with zinc and free base porphyrin. Samples in the range of 5% to 50% concentration were prepared by dissolving the paramagnetic and diamagnetic porphyrins in N, N, Dimethyl-formamide or chloroform and then evaporating the solvent. No effect due to the difference in solvents was seen in the ESR spectra. Dissert. Abstr.

N77-30966 Columbia Univ., New York.
FERROMAGNETISM IN 3d TRANSITION METALS: THEORY AND EXPERIMENT Ph.D. Thesis
William Frederick Lewis, II 1976 95 p
Avail: Univ. Microfilms Order No. 77-6651

A theory of ferromagnetism was derived for a one dimensional system containing doubly degenerate bands. This has been done by rigorously calculating the ground state energy for the case of one net spin reversed. The total wavefunction of the system was constructed from a linear combination of individual orthogonalized atomic orbitals which contained both polar and non-polar

states. The secular equations for this chain were solved and from this an effective exchange constant was determined. The magnetic domain behavior during the hcp to fcc phase transition in cobalt was investigated using electron microscopy. From single and polycrystalline samples it has been observed that defects, such as stacking faults and grain boundaries, will add the transformation of the domain structure between the two phases. From the domain pattern we have also made estimates of the domain wall energy and exchange constant in both the hcp and fcc phases. Dissert. Abstr.

N77-30967 Rutgers - The State Univ., New Brunswick, N. J.
SWITCHING AND CONDUCTION MECHANISMS, DIELECTRIC DISPERSION, AND RF OSCILLATIONS IN POLYCRYSTALLINE THIN FILMS OF TiO2 Ph.D. Thesis
Gordon Charles Taylor 1976 245 p
Avail: Univ. Microfilms Order No. 77-7288

Polycrystalline TiO2 thin films were investigated in the Ti-TiO2 metal counter electrode device configuration. Thin film devices exhibited threshold type resistive switching and current controlled negative resistance. The switching delay time is exponentially dependent upon voltage with an observed minimum value of approximately 0.1 microseconds. The minimum observed switching rise time is approximately .025 microseconds. The recovery time as a function of applied voltage and pulse duration has a minimum value of approximately 0.1 microseconds. The negative resistance characteristic was used to generate stable, voltage tunable, in room temperature rf oscillations up to frequencies of 3 MHz. Oscillators had lifetimes in excess of 400 hours of continuous operation representing > ten to the twelfth power switching cycles. Polycrystalline TiO2 displayed three well defined conduction states in the process of dielectric breakdown. Each of these states was characterized by specific transport and dielectric properties. Dissert. Abstr.

N77-30968 Pennsylvania State Univ., University Park.
ELECTRONIC PROPERTIES OF SINGLE 5-d TRANSITION METAL ATOMS ABSORBED ON METAL SURFACES Ph.D. Thesis
Gary Lee Kellogg 1976 110 p
Avail: Univ. Microfilms Order No. 77-10669

Using field electron and field ion microscopy, values for the surface-induced dipole moments and polarizabilities of single 5-d transition metal atoms adsorbed on the (110) plane of tungsten were experimentally determined. Other experimental quantities associated with the adatoms such as their activation energy for surface diffusion and relative desorption fields were obtained. The experimental results for the adatom polarizability and dipole moments were in qualitative agreement with the charge transfer model of chemisorption. A computer investigation of the effect of reflecting boundaries on one-dimensional random walk diffusion was also carried out. The results are useful for determining what approximations can be made to account for the boundaries, and under what circumstances they are valid. Dissert. Abstr.

N77-30969 North Texas State Univ., Denton.
INVERSION-ASYMMETRY SPLITTING OF THE CONDUCTION BAND IN N-TYPE INDIUM ANTIMONIDE Ph.D. Thesis
Bhushan Dev Bajaj 1976 180 p
Avail: Univ. Microfilms Order No. 77-11095

Stress-induced beating effects in n-type InSb semiconductors were investigated to determine certain band parameters and deformation potentials. The origin of the Shubnikov-de Haas effect, the strain theory, and a simple, classical beating-effects model are discussed. The equipment and the experimental techniques used in recording the Shubnikov-de Haas oscillations of n-type indium antimonide are described. The computer programs used to obtain the theoretical values of the beat nodal position, SdH frequencies, average frequency, the Fermi surface contours, and the energy eigenvalues are given. Dissert. Abstr.

N77-30970 Wayne State Univ., Detroit, Mich.
A Co-57 MOESSBAUER STUDY OF THE COBALT ALUMINOSILICATE GLASS Ph.D. Thesis
Leonard Henry Bieman 1976 97 p
Avail: Univ. Microfilms Order No. 77-9370

It was assumed that the glasses below about 50 K consist of small magnetically ordered regions (domains) whose net magnetic moments relax in a superparamagnetic fashion with a relaxation time, tau = tau sub zero x exp (KV/kT). Here, K is the anisotropy energy density of the domains, and V their volume. At a temperature sufficiently below KV/k the domain moments freeze in random directions, resulting in a sharply reduced susceptibility. At room temperature the Moessbauer spectra consists of three sharp lines, indicating the CO 57 decays into Fe 2(+) and Fe 3(+) with well defined electric field gradients. Below 20 K the spectra are broadened dramatically by magnetic hyperfine fields as large as 48 Teslas. The broadening of the spectra which is observed below 20 K is due to the fact that tau becomes greater than the nuclear lifetime. Computer fitting of the low temperature spectra yielded values of the anisotropy parameter KV. Dissert. Abstr.

N77-30971 Yale Univ., New Haven, Conn.
NUCLEAR MAGNETIC RESONANCE SPECTROSCOPY IN CHOLESTERIC LIQUID CRYSTALS Ph.D. Thesis
Peter John Collings 1976 137 p
Avail: Univ. Microfilms Order No. 77-10866

The dipolar NMR spectra of both long-pitch [40 (microns) and short pitch (0.3 microns)] cholesteric liquid crystals are examined and can be completely understood using a 'twisted nematic' model for cholesterics. Such an analysis yields information on orientational order, anisotropic chemical shift, self-diffusion, and domain alignment. The temperature dependence of the orientational order parameter is remarkably similar in both liquid crystal systems containing a double aromatic ring structure and systems lacking this structure. This phenomenon raises questions about the inter-molecular forces thought to be responsible for the liquid crystal phase. The results also confirm previous evidence on the stability of the blue phase, along with a determination that long-range orientational order exists in an arrangement which appears isotropic if resolution is no less than a micrometer. Dissert. Abstr.

N77-30972 Pennsylvania Univ., Philadelphia.
THEORY OF PHOTOEMISSION FROM MOLECULES IN THE GAS PHASE AND ON SOLID SURFACES Ph.D. Thesis
James Whitman Davenport 1976 186 p
Avail: Univ. Microfilms Order No. 77-10155

The ultraviolet photoionization cross sections for several molecules in the gas phase, and the differential cross sections for oriented carbon monoxide were calculated for the purpose of understanding the photoemission from molecules adsorbed on solid surfaces. The calculation was performed with the X-alpha scattered wave method. Calculated cross sections show strong variations with photon energy, and in particular a sharp resonance was found for certain levels of N2 and CO. The same matrix elements were then used to calculate the angular distribution of photoemission from oriented molecules. From such calculations, it was concluded that upon adsorption CO stands up on the Ni (100) surface with the carbon end down. For CO and N2 in the gas phase the angular asymmetry parameter was calculated for the photon energy range 16 eV - 45 eV. In addition the surface properties of clean nickel using a tight binding Hamiltonian and the Green's function method of Kalkstein and Soven was computed. Dissert. Abstr.

N77-30973 Montana State Univ., Missoula.
ANGLE-RESOLVED PHOTOEMISSION SPECTROSCOPY OF GALLIUM ARSENIDE USING SYNCHROTRON RADIATION Ph.D. Thesis
James Arthur Knapp 1976 170 p
Avail: Univ. Microfilms Order No. 77-9967

Angle-resolved photoemission from the (110) face of Gallium Arsenide was studied using synchrotron radiation. 4 degree resolution, in conjunction with the wide photon energy continuum of synchrotron radiation (hv less than 30 eV), permitted the gathering of considerable dispersion information about the electronic states of the material, both at the surface and in the bulk. Two occupied surface states were identified and portions of their band structure mapped out. The observed states, centered at approx. -1 eV and approx. -6 eV measured from the valence band maximum, have been predicted in several theoretical calculations, observations of bulk transitions concentrated on emissions normal to the surface, for which the transitions occur

primarily along the sigma symmetry line in the bulk Brillouin zone. Data was collected for several different orientations of the electric polarization vector relative to the crystal symmetries. A simple, direct-transition model proved sufficient to explain much of the phenomena, including the identification of several bulk energy band critical points. Dissert. Abstr.

N77-30974 Pennsylvania Univ., Philadelphia.
A THEORETICAL STUDY OF EFFECTS OF SURFACE STATES AND RESONANCES ON FIELD EMISSION Ph.D. Thesis
Nikhiles Kar 1976 133 p
Avail: Univ. Microfilms Order No. 77-10177

A muffin-tin model of the metal was used, with a plane tangential to the last row of muffin tins being considered as the matching plane for the wave functions and derivatives. For an adsorbate covered metal surface, essentially the same model was used, with the last row of atoms now being considered as the adsorbate atoms. A variant of the transfer Hamiltonian scheme was used to calculate the energy resolved field emission current. A surface state in the L1L2 gap was observed for the (100) face of copper. For the (100) face of tungsten, a band of surface states/resonances could explain, a certain structure in field emission observations. The disappearance of the structure with rare gas adsorbed on tungsten (100) face and the persistence of the structure with a gold overlayer-both could be explained qualitatively with the model calculations. Dissert. Abstr.

N77-30975 American Univ., Washington, D.C.
AMORPHOUS RARE-EARTH-IRON ALLOYS BELOW THE CURIE POINT BY MOESSBAUER EFFECT Ph.D. Thesis
William Phillip Pala, Jr. 1976 107 p
Avail: Univ. Microfilms Order No. 77-9818

Mossbauer studies were made on bulk amorphous samples of the R(Y, Tb, Ho, Er, Tm)-Fe alloy series, prepared by dc rapid sputtering techniques. The temperature range of the studies was from room (295 K) to liquid helium (4.2 K). A spin glass-like Curie temperature of 55 K was established for a-YFe2, from the temperature dependence of the hyperfine field and zero relative velocity, single channel, count. The time averaged, magnetic hyperfine field at 4.2 K has been determined for the majority of the samples as follows: a-YFe2, 233 + or - 6 kOe; a-HoFe2, 209 + or - 14 kOe; a-ErFe2, 148 + or - 21 kOe; and an estimate for a-TmFe2, 150 + or - 30 kOe. The film value of a-YFe2 is about 60 kOe lower than the bulk value reported here and scales better by DeGennes factor in the a-RFe2 series. The bulk value, on the other hand, scales better with the a-RFe2 values if their atomic radii are used. Dissert. Abstr.

N77-30976 Pennsylvania Univ., Philadelphia.
MAGNETIC RESONANCE IN SELECTED QUASI-ONE DIMENSIONAL SOLIDS Ph.D. Thesis
Lowell Scott Smith 1976 179 p
Avail: Univ. Microfilms Order No. 77-10222

The magnetic properties of the poly-(metal phosphinates) are closely related to the structure. P-31 nuclear magnetic resonance is used to probe the local magnetization on the superexchange path. The paramagnetic shift measures the density of transferred electron spin at the phosphorus nucleus. This isotropic hyperfine field is approximately the same in amorphous and crystalline forms of these materials. A temperature dependent hyperfine interaction is required to explain the high temperature data. The electron g-tensor of poly-(copper bisdibutyl phosphinate) was determined and is in agreement with the predictions of simple crystal field theory based on the recently determined crystal structure. Dissert. Abstr.

N77-30977 Louisiana State Univ. and A&M Coll., Baton Rouge.
SURFACE AND BULK TRANSPORT COEFFICIENTS IN ANTIMONY Ph.D. Thesis
Ching-Long Tsai 1976 155 p
Avail: Univ. Microfilms Order No. 77-10400

The effect of diverse surface treatments on magnetoresistivity of antimony single crystals of different size was studied. The contribution of surface and bulk current was determined, and results used to obtain the bulk transport coefficients. Transport measurements on electropolished samples under the asymptotic high field condition were analyzed empirically. Measurements of adiabatic and isothermal magnetoresistivity, Nernst-Ettingshausen and Ettingshausen effects and thermal resistivity indicate that the experimentally determined coefficients can be related in a simple manner with the bulk coefficients if proper correction for surface effect is applied. Dissert. Abstr.

N77-30978 Pennsylvania State Univ., University Park.
INVESTIGATION OF THE ELECTRICAL BEHAVIOR AND INTERFACE PHENOMENA IN METAL-GLASS-SEMICONDUCTOR STRUCTURES Ph.D. Thesis
George J. Vendura, Jr. 1976 265 p
Avail: Univ. Microfilms Order No. 77-9609

Chalcogenide MIS devices were examined using four experimental techniques: voltage-current, single and double pulses, photovoltage-incident energy and voltage-capacitance. From the results, tentative band diagrams exhibiting the appropriate binding at the junctions were prepared. The voltage-capacitance study was used to independently reestablish regions of depletion and accumulation. Results were in every way consistent with those of the photovoltaic technique. Silicon oxide devices were investigated by plotting current versus photovoltage for the purpose of establishing general directions for increased solar cell performances. MIS structures involving insulating layers of various thickness and purity were E-gun deposited using SiO as the source material. Dissert. Abstr.

N77-30979 Northwestern Univ., Evanston, Ill.
TEMPERATURE DEPENDENT PROPERTIES, PHONON ANOMALIES AND NEUTRON MAGNETIC FORM FACTORS OF Pd AND Pt METALS Ph.D. Thesis
Tzong-Jer Watson Yang 1976 139 p
Avail: Univ. Microfilms Order No. 77-10104

The electronic band structure, density of states, and Fermi surface of Pd and Pt metals have been calculated using the Augmented-Plane-Wave (APW) method and the Relativistic Augmented-Plane-Wave (RAPW) method respectively. The temperature dependencies of the electrical resistivity, the nuclear-spin-lattice relaxation rate, and the electronic specific-heat coefficient for Pt were also calculated in the constant matrix-element approximation. Phonon anomalies of Pt and Pd are discussed. The magnetic field induced magnetization density and neutron magnetic form factor of Pd and Pt metals are obtained from the APW and RAPW studies of their electronic structure and properties. Dissert. Abstr.

N77-30980 Northwestern Univ., Evanston, Ill.
SURFACE STRUCTURES OF AN ELECTRON-HOLE DROP Ph.D. Thesis
Rativ Kumar Kalia 1976 93 p
Avail: Univ. Microfilms Order No. 77-10044

The surface properties of electron hole droplet in germanium under a varying uniaxial stress was investigated using the multicomponent generalization of density functional formalism. The first gradient correction to exchange and correlation energy is included in the context of variational calculation. The exchange-correlation gradient correction has significant effect on the values of surface tension of electron hole droplet (EHD) in germanium. The surface tension of EHD in unstressed germanium is found to be a factor of sixteen larger than in germanium under a large uniaxial stress. The EHD is negatively charged in unstrained germanium. Dissert. Abstr.

N77-30981 Idaho Univ., Moscow.
AN INVESTIGATION OF CURRENT CONTROLLED LIQUID PHASE EPITAXIAL GROWTH OF III-V COMPOUNDS Ph.D. Thesis
Ali Abul-Fadl 1976 71 p
Avail: Univ. Microfilms Order No. 77-10721

The Peltier cooling and Peltier coefficients of n-type GaAs and n-type InP were measured by passing an electrical current through the GaAs-Ga and InP-In solid-melt interface, respectively, in a vertical liquid phase epitaxy system. Application of a steady-state heat transfer analysis yielded the following values for the Peltier coefficients of GaAs and InP: the coefficient for (II)GaAs is between 0.141 and 0.203 in the temperature range of 530 to 830 C; the value for (II)InP falls between 0.21 and 0.5 in the range of 300 to 600 C. The DC electric currents were used in several experiments to successfully grow epitaxial

layers of InP from the saturated melt of In at constant furnace temperature. The measured grown layer thicknesses were compared with calculated layer thicknesses based on the observed Peltier cooling. The results suggest that the growth is mainly due to the electrotransport of phosphorous atoms to the interface and that the contribution of Peltier induced growth is negligible. Dissert. Abstr.

N77-30982 Pennsylvania State Univ., University Park.
NUCLEAR MAGNETIC RELAXATION IN SOLID ETHANE Ph.D. Thesis
Chi-chang Chiang 1976 106 p
Avail: Univ. Microfilms Order No. 77-9538

Proton spin-lattice relaxation times were measured in solid ethane from 21.3 K to 86.2 K by using a pulsed NMR technique at a frequency of 30 MHz. A correlation time treatment of the T 1 data leads to the values of E sub L and E sub H, the activation energies for molecular motion at low and high temperature, respectively. A comparison of the calculated barriers for the fco (face-centerd orthorhombic) and fcc (face-centered cubic) with the experimental E sub L and E sub H indicates that the fco is the preferred model for the ethane crystal. It is concluded that proton relaxation in the low temperature region can be ascribed to reorientation of the ethane molecular about its threefold axis (C3 rotation); in the high temperature region (starting from 67 K), a second motion such as molecular tumbling (together with translational motion) may combine with the C3 rotation to govern the proton relaxation. Dissert. Abstr.

N77-30983 Maryland Univ., College Park.
THEORY OF SURFACE CHARGE APPLIED TO PLASMA ANODIZATION AND TO SCHOTTKY BARRIER DEVICES Ph.D. Thesis
Martin Charles Peckerar 1976 103 p
Avail: Univ. Microfilms Order No. 77-10411

Surface charge provides the motive force for electron and ion transport during the plasma anodization process. In the case of aluminum oxide on aluminum, electron transport is limited by the Schottky injection mechanism with a barrier of 0.27 eV. Charge trapping occurs at an average trap energy of 1.3 eV and de-trapping also occurs via the Schottky mechanism. A semiconductor-oxide study demonstrated the importance of the specific shape of the density of surface states curve in defining Schottky barrier height. Semiconductor-oxide surfaces, with interface charge spread more homogeneously through the band gap, have parabolic increases in barrier height as oxide film thickness is increased. It was shown that the [100]- interface of GaAS has surface charge localized within 11 A of the oxide-semiconductor interface. The minority-charge bending limits the attainable band bending height to a maximum value equal to the band gap energy. Dissert. Abstr.

N77-30984*# National Aeronautics and Space Administration. Pasadena Office, Calif.
PRODUCTION OF CRYSTALS FROM MOLTEN SOLUTIONS Patent Application
Theodore F. Ciszek (IBM, Hopewell Junction, N.Y.) and Guenter H. Schwuttke, inventors (to NASA) (IBM, Hopewell Junction, N.Y.) Filed 29 Jul. 1977 11 p
(Contracts NAS7-100; JPL-954144)
(NASA-Case-NPO-13969-2; US-Patent-Appl-SN-820499) Avail: NTIS HC A02/MF A01 CSCL 20B

A saturated solution of silicon and an element having a segregation coefficient less than unity (such as carbon), is formed by placing a solid piece of carbon in a body of molten silicon having a temperature differential decreasing toward the surface. A silicon carbide seed crystal is disposed on a holder beneath the surface of the molten silicon. As a rod or ribbon of silicon is slowly pulled from the melt, a supersaturated solution of carbon in silicon is formed in the vicinity of the seed crystal. Excess carbon is emitted from the solution in the form of silicon carbide which crystallizes on the seed crystal held in the cool region of the melt. NASA

N77-30985*# Naval Ocean Systems Center, San Diego, Calif. Infrared Devices Group.
FURTHER CHARACTERIZATION OF IRAS DOPED SILICON DETECTORS
Jun. 1977 147 p
(NASA Order A-39498B)
(NASA-CR-152014) Avail: NTIS HC A07/MF A01 CSCL 20L

Measurements made on several doped-silicon detectors are reported. Topics discussed include: Si:Sb detector, the effects of detector bias on dielectric relaxation; characterization of spontaneous noise and gamma-induced spikes and their circumvention; and the time response of two detectors to step changes in the background photon flux density. Several potential system programs are indicated. Author

N77-30986# Colorado State Univ., Fort Collins. Dept. of Chemistry.
RAMAN SPECTRA OF SiF4 AND GeF4 CRYSTALS
E. R. Bernstein and G. R. Meredith Apr. 1977 44 p refs Submitted for publication
(Contract N00014-75-C-1179; NR Proj. 056-607)
(AD-A039706; TR-11) Avail: NTIS HC A03/MF A01 CSCL 20/2

The Raman scattering spectra of large single crystals of SiF4 and GeF4 at 77K are reported. These data have been reinterpreted based on the absence of any observable changes in the spectra for scattering angles between 0 and 90 deg. The previous assignment of the dipole allowed nu3 and nu4 modes in terms of a TO/LO splitting (i.e., polariton) model is thereby shown to be incorrect. In the absence of an apparently correct crystal structure, an exact interpretation of the data in terms of a factor group-exciton analysis is not possible; nonetheless all observations are shown to be consistent with a multimolecular primitive (non-cubic) unit cell. Mixed SiF4/GeF4 crystal spectra have also been obtained which demonstrate that GeF4 does not substitute into the SiF4 lattice but that SiF4 does enter the GeF4 crystal substitutionally. Author (GRA)

N77-30987# Office of Naval Research, London (England).
THE 13TH INTERNATIONAL SEMICONDUCTORS CONFERENCE
P. Craig Taylor, Thomas L. Reinecke, and Brude D. McCombe 3 Mar. 1977 17 p Conf. held in Rome, 30 Aug. - 3 Sep. 1976
(AD-A039601; ONRL-C-2-77) Avail: NTIS HC A02/MF A01 CSCL 20/12

The major topics of this conference were generally the same as those emphasized at the two previous conferences Stuttgart, 1974, and Warsaw, 1972. The following subjects which were of particular interest at this meeting are reviewed surfaces and interfaces, excitons and exciton condensation, disordered semiconductors, and future semiconductor devices. In addition, selected presentations concerned with impurities, lattice dynamics, band structure, and one- and two-dimensional systems are also summarised. Author (GRA)

N77-30988# IBM Watson Research Center, Yorktown Heights, N.Y.
INVESTIGATION OF NOVEL TUNNELING PHENOMENA IN SEMICONDUCTORS Final Report, 1 Feb. 1974 - 31 Dec. 1976
Leo Esaki 15 Mar. 1977 16 p
(Contract DAAG29-76-C-0032)
(AD-A039865; ARO-11574.34-P) Avail: NTIS HC A02/MF A01 CSCL 20/12

Quantum states are created in semiconductor superlattices made of periodic, ultrathin layers of GaAs and GaAlAs grown by molecular beam epitaxy. By controlling the periodic potential, these states are controlled in energy positions, bandwidths and anisotropy, which results in unusual optical and electronic transport properties, as demonstrated from a variety of physical measurements such as resonant tunneling, photoconductivity, resonant Raman scattering and magneto-oscillations. Also, during the course of this study, the molecular beam epitaxy technique has been established to produce atomically smooth and coherent layers, and surface studies have been carried out to yield important information about surface reconstruction, surface states and oxygen adsorption characteristics. Author (GRA)

N77-30989# IRT Corp., San Diego, Calif.
EFFECTS OF LOW-TEMPERATURE NEUTRON IRRADIA-

TION ON ARSENIC-DOPED SILICON Final Report, 1 Apr. 1975 - 30 Sep. 1976
A. H. Kalma and C. J. Fischer Griffiss AFB, N. Y. RADC Feb. 1977 78 p refs
(Contract F19628-75-C-0138; AF Proj. 5621)
(AD-A039947; INTEL-RT-8129-007; RADC-TR-77-84) Avail: NTIS HC A05/MF A01 CSCL 20/12

Arsenic-doped silicon material obtained from LWIR detector manufacturers (Aerojet and Rockwell) or a supplier of these manufacturers (High Performance Technology) was irradiated with neutrons at 10 K, and the optical response and electrical properties were measured. The material was of the grade from which quality LWIR detectors could be fabricated. The primary effect of irradiation was the net introduction of acceptor centers at a rate of approximately 16/cm. This introduction rate was independent of oxygen concentration in the material, but its dependence on arsenic or acceptor concentration was not determined in this program. The primary effect of the radiation-induced acceptors is to compensate the arsenic levels, which decrease the majority-carrier lifetime and thus the responsivity. The acceptors also decrease the carrier concentration at low temperature. Irradiation-induced mobility changes are relatively slight, showing that the low-temperature mobility prior to irradiation is primarily set by neutral impurity scattering. Some band tailing is produced by the radiation, but this is unstable and anneals to a large extent by 100 K. It is replaced by a short-wavelength depression (or a long-wavelength enhancement) in the spectral response, which may be another manifestation of the same defects. In general, the damage effects were quite stable, and few changes were observed in the measured properties up to annealing temperatures of 400 C. GRA

N77-30990# Purdue Univ., Lafayette, Ind. Properties Research Lab.
SPECTRAL AND TOTAL EMISSIVITY AND REFLECTIVITY AT HIGH TEMPERATURES Final Report, 1 Feb. 1976 - 31 Jan. 1977
R. E. Taylor and D. P. Dewitt Mar. 1977 63 p refs
(Contract AF-AFOSR-2967-76; AF Proj. 9750)
(AD-A039209; PRC-130; AFOSR-77-0544TR) Avail: NTIS HC A04/MF A01 CSCL 20/13

The automated high temperature emissometer for the accurate measurement of spectral emissivity from 0.6 to 11 micrometers and also total emissivity is described. This emissometer is used in conjuction with the multiproperty apparatus which measures a number of thermophysical properties on the same specimen. Spectral emissivity data for tantalum at 1500 K measured with the emissometer is compared to literature values. These data were found to generally agree within 2% below 7 micrometers, but to diverge at longer wavelengths. With the use of improved amplifiers and of signal detectors with increased sensitivity, the accuracy above 7 micrometers is expected to improve significantly. Author (GRA)

N77-30991# Colorado State Univ., Fort Collins. Dept. of Chemistry.
ON THE JAHN-TELLER EFFECT IN ReF6
G. R. Meredith, J. D. Webb, and E. R. Bernstein Apr. 1977 63 p refs
(Contract N00014-75-C-1179)
(AD-A039705; TR-10) Avail: NTIS HC A04/MF A01 CSCL 20/2

New experimental and theoretical work has led to a re-evaluation of the Jahn-Teller effect in ReF6. Low temperature neat and mixed crystal Raman and absorption spectra have been taken. The theory applicable to two Jahn-Teller active vibrations and to a Jahn-Teller molecule in a low symmetry crystalline field is discussed. The main conclusions of the study are that: 1) the standard linear Jahn-Teller treatment of vibronically active modes as independent motions characterized by a given vibronic angular momentum is in general inadequate; 2) Renner-Teller (quadratic) or higher order vibronic coupling terms are important; 3) crystal field splitting of the vibronic levels is not observed; and 4) vibrational exciton band widths of the Jahn-Teller active vibrations are substantially reduced. Author (GRA)

N77-30992# Colorado Univ., Boulder. Dept. of Electrical Engineering.
SINGLE CRYSTALS OF YTTRIUM AND RARE EARTH GALLIUM PEROVSKITES FOR USE AS SUBSTRATES FOR BUBBLE DOMAIN IRON PEROVSKITES Final Report
Seymour Geller 30 Aug. 1976 7 p refs
(Contracts N00014-75-C-0782; N00014-67-A-0405-0005)
(AD-A039932) Avail: NTIS HC A02/MF A01 CSCL 20/3

It has been shown that a number of rare earth gallium oxide perovskites can be synthesized at normal pressure and temperatures exceeding 1650 C. Single crystals of NdGaO3 suitable as substrates for orthoferrites have been grown. The crystal structure of a newly found high temperature modification of YGaO3 has been determined. Thin single crystal epitaxial films of Sm0.55Tb0.45FeO3 have been grown on NdGaO3 substrates, but they have been too thin to sustain bubble domains. It is still believed that it should be possible to grow epitaxial orthoferrite films of suitable thickness on rare earth gallium oxide perovskite substrates. GRA

N77-30993# Cornell Univ., Ithaca, N.Y.
SUPERCONDUCTIVITY IN NONSTOICHIOMETRIC COMPOUNDS Interim Report, 1 Jan. - 31 Dec. 1976
M. J. Sienko 11 Jan. 1977 8 p refs
(Grant AF-AFOSR-2583-74; AF Proj. 9764; AF Proj. 2306)
(AD-A039134; AFOSR-77-0506TR) Avail: NTIS HC A02/MF A01 CSCL 20/3

The objective of this research is to examine the effect of changing chemical composition on the properties of superconducting chemical compounds. Compounds likely to be superconducting are synthesized. Properties are investigated as functions of departure from stoichiometry and cation-for-cation or anion-for-anion substitution. The special role of localized magnetic moments on quenching superconductivity is examined. Author (GRA)

N77-30994# Army Materials Research Agency, Watertown, Mass. Materials Science Div.
COINCIDENCE IN RECTANGULAR LATTICES Final Report
Gordon A. Bruggeman and George H. Bishop, Jr. Feb. 1977 14 p refs
(DA Proj. 1T1-61102-AH-42)
(AD-A040840; AMMRC-TR-77-5) Avail: NTIS HC A02/MF A01 CSCL 20/2

The conditions for the formation of rows of coincidence sites in two-dimensional rectangular lattices are considered for varying values of the axial ratio. The complete-pattern-shift lattice (DSC lattice), which defines the pattern-preserving displacements of one crystal relative to the other for a given coincidence array, degenerates into a series of parallel lines from a series of discrete points as the coincidence array changes from a two-dimensional to a one-dimensional pattern in misoriented planar lattices, or from a CSL to a two-dimensional array in misoriented three-dimensional crystals. The apparent freedom of definition in the pattern-preserving displacements for these lower-order coincidence arrays is without physical significance to real grain boundary structures, however, in that conditions must not be too far removed from those of exact coincidence for meaningful pattern-preserving displacements to be obtained. Thus their significance to general boundary structures is limited unless they can be associated with a near-coincidence relationship. GRA

N77-30995# Vermont Univ., Burlington. Dept. of Physics.
THERMODYNAMIC AND TRANSPORT PROPERTIES OF INTERSTITIAL HYDROGEN ISOTOPES IN METAL SYSTEMS Progress Report, 1 Apr. 1976 - 31 Mar. 1977
J. S. Brown 1977 18 p refs
(Contract EY-76-S-02-3551)
(COO-3551-32) Avail: NTIS HC A02/MF A01

Three problems are reviewed. The first is the inclusion of multiple scattering corrections to the single-site density states N(E) for liquid Pd. A liquid metal band structure calculation is used. Second, calculation of the superconducting transition temperature T/sub c/ in the non-stoichiometric hydrides and deuterides of Pd is discussed. Third, work done in studying electronic transport in the 3d transition metal Ti, including studies of the structure factor a(g) for this material, is discussed. ERA

N77-30996# Lear Siegler, Inc., Santa Monica, Calif.
SOLID STATE RESEARCH 1976:4 Quarterly Technical

Summary Report, 1 Aug. - 31 Oct. 1976
Alan L. McWhorter 15 Nov. 1976 95 p refs
(Contract F19628-76-C-0002)
(AD-A039175; ESD-TR-76-327) Avail: NTIS HC A05/MF A01 CSCL 20/12

This report covers in detail the solid state research work of the Solid State Division at Lincoln Laboratory for the period 1 August through 31 October 1976. The topics covered are Solid State Device Research, Quantum Electronics, Materials Research, Microelectronics, and Surface-Wave Technology. Funding is primarily provided by the Air Force, with additional support provided by the Army (BMDATC), ARPA, MSO, IPTO, NSF, and ERDA. Author (GRA)

77 THERMODYNAMICS AND STATISTICAL PHYSICS

Includes quantum mechanics; and Bose and Fermi statistics.

For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer.*

N77-30997 Northwestern Univ., Evanston, Ill.
CONTRIBUTIONS TO THE MICROSCOPIC THEORIES OF CLASSICAL AND QUANTUM LIQUIDS Ph.D. Thesis
Sudip Chakravarty 1976 161 p
Avail: Univ. Microfilms Order No. 77-10011

Integral equations for statistical distribution functions are derived and used to study the properties of classical and quantum liquids. A microscopic theory of liquid crystals by including short range correlations was built. As a prelude to a variational calculation for electron correlations at metallic densities, the weakly interacting Bose gas has been investigated to bring out clearly the nuances of the many body wave function known as the Jastrow function. A variational calculation for electron correlations at metallic densities is presented. Dissert. Abstr.

N77-30998*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
SIMULATION OF THE HEAT TRANSFER CHARACTERISTICS OF LOX
R. C. Hendricks 17 Aug. 1977 10 p refs Presented at the 17th Natl. Heat Transfer Conf., Salt Lake City, 14-17 Aug. 1977; sponsored by the Am. Soc. of Mech. Engr.
(NASA-TM-X-73634) Avail: NTIS HC A02/MF A01 CSCL 20M

Forced convection heat transfer data for fluid nitrogen flowing through a vertical tube were acquired and assumed to simulate the heat transfer characteristics of LOX. Comparisons between LN2 and LOX data over the pressure range for T sub r <1 using a modified form of Petukhov's correlation factor was shown, qualitatively, to substantiate the simulation. Other parameters (buoyancy, Stanton number, and relative velocity), were found to group those data; assessment of these parametric interrelations must be made before the simulation can be termed quantitative. Author

N77-30999*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
VELOCITY AND TEMPERATURE PROFILES IN NEAR-CRITICAL NITROGEN FLOWING PAST A HORIZONTAL FLAT PLATE
Robert J. Simoneau 17 Aug. 1977 12 p refs Presented at 17th Natl. Heat Transfer Conf., Salt Lake City, 14-17 Aug. 1977; sponsored by the Am. Soc. of Mechanical Engineers
(NASA-TM-X-73635) Avail: NTIS HC A02/MF A01 CSCL 20M

Boundary layer velocity and temperature profiles were measured for nitrogen near its thermodynamic critical point flowing past a horizontal flat plate. The results were compared measurements made for vertically upward flow. The boundary layer temperatures ranged from below to above the thermodynamic critical temperature. For wall temperatures below the thermodynamic critical temperature there was little variation between the velocity and temperature profiles in three orientations. In all three orientations the point of crossing into the critical temperature region is marked by a significant flattening of the velocity and temperature profiles and also a decrease in heat transfer coefficient. Author

N77-31000# System Development Corp., Huntsville, Ala.
A FOUR-LAW LOGIC COMMENT ON TIME, QUANTUM CHANGE, AND UNIVERSE CLOSURE
Thomas E. Bearden 20 Apr. 1977 16 p refs
(AD-A039108) Avail: NTIS HC A02/MF A01 CSCL 20/10

From the fourth law of logic, the universe is both open and closed simultaneously, although unobservably so. When observation is operationally applied, the universe may appear exclusively open or exclusively closed, depending upon the conditions of applying the operational observation. The argument over whether space is positively or negatively curved, and hence closed or open, is therefore specious since the answer will vary depending on the logic which applies to the particular observational conditions. GRA

N77-31001# National Physical Lab., Teddington (England). Div. of Chemical Standards.
THE THERMODYNAMIC PROPERTIES OF BENZENE AND TOLUENE
J. F. Counsell, I. J. Lawrenson, and E. B. Lees Sep. 1976 16 p refs
(NPL-Chem-52) Avail: NTIS HC A02/MF A01

A method for calculating the thermodynamic properties from selected experimental data is described and applied to two compounds of industrial importance, benzene and toluene. Values of temperature, volume and pressure, or of temperature, volume and enthalpy, obtained from selected experimental data are correlated by an equation representing the Helmholtz energy A(V,T) as a function of volume V and temperature T. ESA

N77-31002# Loughborough Univ. of Technology (England). Dept. of Mathematics.
ON THE PROPAGATION OF PHOTONS AND NEUTRINOS IN CURVED SPACE-TIME
J. B. Griffiths Oct. 1976 10 p refs
(MATHS-Res-103) Avail: NTIS HC A02/MF A01

Investigations were carried out using the framework of the general theory of relativity. Attempting to incorporate a wave theory of light into general relativity, the calculations confirmed some results already obtained in the geometrical optics approximation; however, by taking different equations for photons (Maxwell's equations) and neutrinos (Weyl's equation) certain differences in the behavior of the two particles became apparent. It is also shown that neutrinos have the anomalous property that the sign of the energy density may change as they propagate, and they may even become ghost neutrinos in some regions.
Author (ESA)

N77-31003# California Univ., Los Angeles. School of Engineering and Applied Science.
STUDIES OF SUPERCRITICAL HELIUM-4 AT LOW TEMPERATURES DURING HEAT FLOW INCLUDING DISORDERED BOUNDARY DOMAIN INVESTIGATIONS Progress Report
T. H. K. Frederking, S. Caspi, Y. W. Chang, and J. Y. Lee Nov. 1976 102 p refs
(Grant NSF ENG-74-24341)
(PB-266872/1; UCLA-ENG-76109) Avail: NTIS HC A06/MF A01 CSCL 20M

Lambda-transition curves during heat flow above the thermodynamic critical pressure have been studied. Reference functions for single-phase He2 and single-phase He1 have been established to provide better assessment of two-phase data at supercritical pressures. A C-frame apparatus has been used to simulate for He1 simulation of centrifugal buoyancy forces in rotating cooling systems. GRA

80 SOCIAL SCIENCES (GENERAL)

Includes educational matters.

N77-31004*# Washington Univ., St. Louis, Mo. Center for Development Technology.
IDENTIFICATION OF AN EDUCATIONAL PRODUCTION FUNCTION FOR DIVERSE TECHNOLOGIES
Roger L. McClung Jan. 1977 214 p refs
(Grants NGR-26-008-054; NSF EC-38871)
(NASA-CR-154286; CDT-77/2) Avail: NTIS HC A10/MF A01 CSCL 05I

Production function analysis used to estimate the cost effectiveness of three alternative technologies in higher education: traditional instruction, instructional television, and computer-assisted instruction is presented. Criteria and selection of a functional form are outlined and a general discussion of variable selection and measurement is presented. Author

N77-31005*# California Univ., Berkeley. Inst. of Governmental Studies.
INTERACTIONS OF TECHNOLOGY AND SOCIETY: IMPACTS OF IMPROVED AIRTRANSPORT. A STUDY OF AIRPORTS AT THE GRASS ROOTS
Todd LaPorte, Stephen Rosenthal, Stuart Ross, Kai N. Lee, and Edith Levine Washington NASA Jul. 1977 396 p refs
(Grant NGR-05-003-471)
(NASA-CR-2871) Avail: NTIS HC A17/MF A01 CSCL 01E

The feasibility of applying a particular conception of technology and social change to specific examples of technological development was investigated. The social and economic effects of improved airport capabilities on rural communities were examined. Factors which led to the successful implementation of a plan to construct sixty small airports in Ohio are explored and implications derived for forming public policies, evaluating air transportation development, and assessing technology. Author

81 ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

N77-31006# Committee on Science and Technology (U. S. House).
NASA-PROGRAM PLANNING AND CONTROL
Washington GPO 1976 210 p Rept. by the Subcomm. on Space Science and Applications of the Comm. on Sci., and Technol., 94th Congr., 2d Sess., Dec. 1976
(GPO-80-490) Avail: Subcomm. on Space Science and Applications

To provide a basis for better examination of the employment of resources of NASA, a review of program planning and control was undertaken. A data base was designed to examine manpower, dollars, facilities, and nature of programs underway and the planning and control process used to organize and direct resources to accomplish goals and objectives. Author

N77-31007# Office of the Chief of Staff (Army), Washington, D. C.
AUTOMATION MANAGEMENT STUDY, DIRECTOR OF ARMY AUTOMATION (DAA) Final Report
Miriam F. Levine 25 Feb. 1977 65 p refs
(AD-A039565) Avail: NTIS HC A04/MF A01 CSCL 05/1

The Automation Management Study was a 7-month study effort which produced the Charter and implementing documents for the central manager of Army Automation, the Director of Army Automation (DAA). The DAA organizationally and functionally replaced the Director, Management Information Systems, Office Chief of Staff Army. The Mission of the DAA is to manage automation by establishing automation policy, developing comprehensive, integrated automation plans, exercising broad resource management responsibilities, and evaluating the execution of plans and programs to employ automation technology within the Army. Army automation encompasses computer-based systems which support management or mission functions, and are configured for operations in combat or special environments, or are embedded within combat weapons systems. Operational functions associated with the life cycle management of automated systems will be decentralized to Army Staff agencies and major commands. Three new organizational structures to support the DAA are the Automation Management Offices, the Army Automation Steering Committee, and the Army Command and Control Management Structure. Author (GRA)

N77-31008# Rochester Univ., N. Y. Graduate School of Management.
A PRIORITY BIDDING METHOD FOR OPTIMAL RESOURCE SCHEDULING Final Report
Lee Mairs (US Navy, Washington, DC) Oct. 1976 40 p refs
(Grant NSF NM-44241)
(PB-267076/8) Avail: NTIS HC A03/MF A01 CSCL 05A

Several alternative queue ordering approaches are examined to determine the relationship between input stream characteristics and the resultant value of output. Finally, a new method of single-server queue ordering through a user determined priority scheme is presented that under certain mild assumptions selects the correct job, is easily implemented, and provides the correct incentives necessary to minimize costs arising from user gaming to beat the system. The criteria used to judge the proposed system is the maximization of the value of output. The resultant solution can be applied to multi-serve systems without change. GRA

82 DOCUMENTATION AND INFORMATION SCIENCE

Includes information storage and retrieval technology; micrography; and library science.

For computer documentation see *61 Computer Programming and Software*.

N77-31009# British Library, London (England).
EDITORIAL PROCESSING CENTRES: SCOPE IN THE UNITED KINGDOM
A. M. Woodward May 1976 33 p refs
(BLRD-5271-HC; ISBN-0-85350-139-4) Copyright. Avail: British Library Lending Div., Boston Spa, Engl.: £2.00

The economic benefits of using developments in printing and data processing techniques in the publishing of scholarly works by learned societies are discussed. The publishing practices of learned societies in the US and the United Kingdom are compared. An editorial processing center is proposed, based on a cooperative arrangement between a number of societies to achieve economic volume of output and to provide the resources for investment development in the United Kingdom. A.R.H.

N77-31010 Illinois Univ., Urbana-Champaign.
AN ANALYSIS OF ROTATIONAL STORAGE ACCESS SCHEDULING IN A MULTIPROGRAMMED INFORMATION RETRIEVAL SYSTEM Ph.D. Thesis
James Michael Milner 1976 197 p
Avail: Univ. Microfilms Order No. 77-9106

The effects of five secondary storage access scheduling policies are studied in the context of a multiprogrammed information retrieval system. A model which captures the essential behavior of the class of systems under study is described. Important parameters of the model are determined from a study of an actual system, MEDLINE. The behavior of the model under each of the five scheduling policies is studied both analytically and via simulation. Results show unexpectedly poor performance by the commonly used SCAN scheduling policy. Better scheduling policies are defined and features which characterize good and bad policies are enumerated. Details of the MEDLINE study and the simulator are included in appendixes along with an atlas of simulation results. Dissert. Abstr.

N77-31011*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
AN AUTOMATED LIBRARY FINANCIAL MANAGEMENT SYSTEM
Sarah Dueker and Linda Gustafson (Technical Develop. Corp., Sunnyvale, Calif.) Aug. 1977 19 p
(NASA-TM-78424; A-6914) Avail: NTIS HC A02/MF A01 CSCL 05B

A computerized library acquisition system developed for control of informational materials acquired at NASA Ames Research Center is described. The system monitors the acquisition of both library and individual researchers' orders and supplies detailed financial, statistical, and bibliographical information. Applicability for other libraries and the future availability of the program is discussed. Author

N77-31012*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ATMOSPHERIC AND OCEANOGRAPHIC INFORMATION PROCESSING SYSTEM (AOIPS) SYSTEM DESCRIPTION
P. A. Bracken, J. T. Dalton, J. B. Billingsley, and J. J. Quann Mar. 1977 118 p refs Presented at Machine Process. of Remotely Sensed Data, West Lafayette, Ind., 21-23 Jun. 1977
(NASA-TM-X-71342; X-933-77-148) Avail: NTIS HC A06/MF A01 CSCL 05B

The development of hardware and software for an interactive, minicomputer based processing and display system for atmospheric and oceanographic information extraction and image data analysis is described. The major applications of the system are discussed as well as enhancements planned for the future. Author

N77-31013# Washington Univ., Seattle. Dept. of Oceanography.
WHIMPER: A LIBRARY OF TIME SERIES PROGRAMS UNIVERSITY OF WASHINGTON, FOR USE ON CDC 6400 COMPUTER
James D. Irish, Donna J. Bendiner, Murray D. Levine, and Judy Zeh Dec. 1976 80 p
(Contract N00014-67-A-0103-0014)
(AD-A039500; TR-342; Ref-M76-105; APL-7508) Avail: NTIS HC A05/MF A01 CSCL 09/2

Documentation is provided for the use of computer subroutines for data analysis on the University of Washington campus computer. This includes routines for data storage and retrieval, spectral analysis, filtering, and tidal analysis. GRA

N77-31014# Computer Sciences Corp., Arlington, Va.
DESCRIPTION OF THE REMOTE TERMINAL EXECUTIVE (REMTEX) POSTPROCESSOR
William Harold Pollitt and Mary Catherine Flythe Washington Command and Control Technical Center 10 Jan. 1977 109 p refs
(Contract DCA100-74-C-0002)
(AD-A040634; CCTC-TM-144-77) Avail: NTIS HC A06/MF A01 CSCL 09/2

This Technical Memorandum (TM) describes the newly developed REMote Terminal EXecutive (REMTEX) Postprocessor software system. User interaction and input requirements are described and output formats are presented. Basic program and file maintenance instructions are included. Author (GRA)

N77-31015# Educational Testing Service, Princeton, N.J.
APPLICATION DESCRIPTION AND EVALUATION FOR NLS
David A. Potter Jul. 1976 31 p
(Contract MDA903-74-C-0290; ARPA Order 2651)
(AD-A040959; ETS-3) Avail: NTIS HC A03/MF A01 CSCL 09/4

NLS (On-Line System) is a text-editing, dialog-support, and communications system which provides users with a state-of-the-art tool for document production, communication, and information management and retrieval. This paper reviews the history of NLS at one site, and indicates the range of potential uses for the tools inherent to NLS. These uses were primarily for correspondence, document production, and information management. An informal evaluation is the second major part of this report. It concentrates on users' impressions of the system's utility, ease of access, and factors which might impede acceptance. Sample products and a discussion of office automation conclude the report. Author (GRA)

N77-31016# Illinois Univ., Urbana. Dept. of Computer Science.
BURSTLOCK: A DIGITAL PHASE-LOCKED LOOP USING BURST TECHNIQUES M.S. Thesis
Colan Michael Robinson May 1977 40 p refs
(Contract N00014-75-C-0982)
(AD-A040914; UIUCDCS-R-77-872; UILU-ENG-77-1721) Avail: NTIS HC A03/MF A01 CSCL 09/4

BURSTLOCK is a digital phase-locked loop implemented using Burst Processing. It is used in a receiver perform FM demodulation of commercial broadcast signals. It is also shown that BURSTLOCK has some theoretical advantages over conventional phase-locked loops. Author (GRA)

N77-31017# Applied Physics Lab., Johns Hopkins Univ., Laurel, Md. Applied Physics Lab.
A CASE STUDY OF A PROGRAM LIBRARY TECHNIQUE
P. R. Popick May 1977 19 p
(Contract N00017-72-C-4401)
(AD-A040929; APL/JHU-TG-1310) Avail: NTIS HC A02/MF A01 CSCL 09/2

Program libraries have been used in the past in conjunction with structured programming, but very little attention has been given to the advantages of using a program library as a separate technique. As a separate technique, the program library increases project visibility and has the added advantage of being easily implemented with no retraining of the technical staff. The program library technique is outlined in this report and details of an implementation on a medium-sized project are given. This case study can serve as a guideline for an implementation of a program library on other projects. Many small-to-medium scale projects, that have heretofore ignored structured programming techniques because of personnel retraining costs and delay of implementation, may rapidly implement a program library to increase productivity, improve configuration management, and increase project visibility. Author (GRA)

N77-31018# Johns Hopkins Univ., Baltimore, Md. Center for Research in Scientific Communication.
QUALITY INDICATORS IN THE SCIENTIFIC JOURNAL ARTICLE PUBLICATION PROCESS Final Report, 1 Jan. 1973 - 30 Jun. 1975
S. D. Gottfredson, W. D. Garvey, and J. Goodnow Jan. 1977 121 p refs
(Grant NSF GN-36193)
(PB-266993/5; JHU-CRSC-29) Avail: NTIS HC A06/MF A01 CSCL 05B

A series of studies of several scientific and engineering disciplines spanning more than a decade are presented to examine issues of: (1) the use made of scientific/engineering information contained in published journal articles; (2) peer and expert-peer assessments of characteristics of the information; (3) author, peer, and expert peer assessments of the development of the fields represented by a set of referent journal articles, and the role played by the information contained in the articles in that development; (4) peer and expert peer judgments of the time-frame involved in the importance of scientific/engineering information; and (5) the relations among peer assessments of the quality of specific scientific works and output measures such as citations and publications. GRA

N77-31019# National Bureau of Standards, Washington, D. C.
DIMENSIONS. VOLUME 61, NUMBER 3 Monthly Report
Mar. 1977 37 p refs
(PB-266997/6; NBS-DIM-61-3) Avail: NTIS HC A03/MF A01 CSCL 05B

Short summations of major technical developments, highlights of work in progress, major speeches and statements by Bureau management, and a listing of NBS publications are presented. Topics discussed include: (1) incentives for solar heating systems; (2) smoke detectors; (3) mechanisms for removal of hydrocarbons from lower atmosphere; (4) electrically tuned far infrared lasers; and (5) air pollution standard reference materials. Author

N77-31020# New York Univ., N. Y. Linguistic String Project.
EVALUATION OF AUTOMATED NATURAL LANGUAGE PROCESSING IN THE FURTHER DEVELOPMENT OF SCIENCE INFORMATION RETRIEVAL Final Report, 1 Aug. 1973 - 31 Jan. 1976
Naomi Sager Jul. 1976 113 p refs
(Grant NSF GN-39879)

(PB-266948/9; String-Program-10) Avail: NTIS HC A06/MF A01 CSCL 05G

Advances in computerized natural language processing (NLP) are described and related to present and potential functions of information systems. Developments in the information field which have led to a renewed interest in NLP, and how NLP programs could be used to provide new information services operating on natural language data bases are discussed along with the basis for such programs in the inherent relation between information and language structure. Other topics dicussed include: (1) the stages of processing which take largely unrestricted natural language input of the type encountered in scientific communications into data structures suitable for advanced types of information processing; (2) a clustering program for generating informationally significant world classes from documents in particular subject areas; and (3) examples and suggestions as to how NLP techniques could be applied in information systems. Author

N77-31021# Ohio State Univ., Columbus. Computer and Information Science Research Center.

A METHODOLOGY FOR THE PERFORMANCE EVALUATION OF INFORMATION PROCESSING SYSTEMS Final Report

Thomas G. Delutis Mar. 1977 194 p refs

(Grant NSF GN-36622)

(PB-266943/0; OSU-CISRC-TR-77-2) Avail: NTIS HC A09/MF A01 CSCL 05B

The Information Processing System Simulator (IPSS) a methodology developed for investigating the behavior of complex computer based information processing systems, was designed to serve three distinct users: the researcher, the information system analyst/designer, and the student. It permits the modeler to define a sequence of processing transformations which successively alter user queries into performance measures. The IPSS language facilities permit the modeler to describe and examine the processes which occur in modern day computer based information system, and are applicable to all aspects of hardware and software architectures. GRA

N77-31022# Xerox Electro-Optical Systems, Pasadena, Calif.

SYSTEM CONCEPTS FOR NETWORK USE OF FULL-TEXT FILES Final Report

Don Winter, Nilo Lindgren, Judy Kaye, and Don Stewart May 1977 199 p refs

(Contract NSF C-76-05637)

(PB-267206/1) Avail: NTIS HC A09/MF A01 CSCL 05B

System concepts and tradeoffs for the provision of full-text files over a resource sharing network were developed. System models and hardware and software characteristics and configurations were examined to establish the technological and economic feasibility of full-text file systems. Questions of political, social, and organizational feasibility of full-text file systems were examined, in order to evaluate methods of fostering the development of full-text file systems, and to compile an agenda of programs and/or advanced studies required to develop and promote the use of full-text files. Author

N77-31023# Logica Ltd., London (England).

MINI-COMPUTERS AND BIBLIOGRAPHIC INFORMATION RETRIEVAL

Mike Hyman and Eleanor Wallis Jul. 1976 189 p refs

(BLRD-5305-HC; ISBN-0-85350-144-0) Copyright. Avail: British Library Lending Div., Boston Spa, Engl. £5.00

The characteristic features of minicomputers are described along with their differences from the larger machines on which most bibliographic information retrieval systems are based. The nature of bibliographic information retrieval, the design and operation of minicomputer based information retrieval systems, and the advantages and limitations of alternative approaches are discussed. The relative merits of on-line and batch processing for the various components of the system and the selection of storage media, file structure, terminal equipment, enquiry languages, and programming languages are included. The technical features and costs of four model systems are given to illustrate the potential use of minicomputers. Author

83 ECONOMICS AND COST ANALYSIS

Includes cost effectiveness studies.

N77-31024# Massachusetts Inst. of Tech., Cambridge. Operations Research Center.

OPTIMIZATION MODELS FOR PLANNING ECONOMIC DEVELOPMENT

Silvia Pariente Apr. 1977 64 p refs

(Contract N00014-75-C-0556; NR Proj. 347-027; MIT Proj. OSP-82491)

(AD-A039165; TR-130) Avail: NTIS HC A04/MF A01 CSCL 05/3

In recent years, more and more countries have experimented with quantitative methods as a way to design short term and long term plans, and to evaluate the impacts of investment and other policies on the future development of their economies. Optimization models have proved useful in several fields of economics, such as economic growth and development planning, urban and regional economics, agricultural and energy economics, etc. The purpose of this paper is to formulate optimization models that can be applied fruitfully for economy-wide planning, sectoral planning, and project evaluation. It is an attempt at synthesizing the different models encountered in the literature, and at describing some of the difficulties inherent to this approach. Author (GRA)

N77-31025# Texas Univ., Austin. Center for Cybernetic Studies.

MANAGERIAL ECONOMICS: PAST, PRESENT AND FUTURE

A. Charnes and W. W. Cooper (Harvard Univ.) Mar. 1977 52 p refs Presented at Southwestern Soc. Sci. Assoc. Meeting, Dallas, Tex., 31 Mar. 1977

(Contracts N00014-75-C-0569; Grant NSF SOC-76-156876; NR Proj. 047-021)

(AD-A040549; CCS-287) Avail: NTIS HC A04/MF A01 CSCL 12/2

In this paper the present state of managerial economics is portrayed against the backdrop of a still-continuing series of methodological developments which began to impact on the civilian management sector in the late 1950's. Historically these developments were associated with changes that were occurring in disciplines like Operations Research, Management Science, and Systems Sciences. The latter involved an orientation toward civilian (private enterprise) management in place of a previous almost exclusive focus on problems in military management. This, in turn, caused these disciplines to interact with and impact on developments in managerial economics. This paper suggests that managerial economics, and these other disciplines should (and will) expand their focus in the near future to include management problems in the public sector. This should increase the interactions between them and also improve their ability to deal with problems in private (and military) management as well. Examples of how this might be accomplished are suggested in this paper via PPBS formats for local government and private enterprise management, along with methods of measuring management performance directed to multiple objectives in private as well as public sector management. Author (GRA)

84 LAW AND POLITICAL SCIENCE

Includes space law; international law; international cooperation; and patent policy.

N77-31026# Committee on Science and Technology (U. S. House).

NASA AUTHORIZATION, 1978, VOLUME 3

Washington GPO 1977 770 p Hearing on H.R. 2221 (superseded by H.R. 4088) before Comm. on Sci. and Technol., 95th Congr., 1st Sess., No. 8, 1 Feb. 1977

(GPO-92-950) Avail: Comm. on Sci. and Technol.

A summary of the major highlights and new directions in

NASA programs is presented along with the agency's operating plan for FY 1977. Other documentation includes questions and answers for the record requested by the House Committee, a review of NASA's equal employment opportunity program, a record of FY 1976 annual procurement, contractor selection for the TDRSS, the TDRSS contract, and Satellite Solar Power: Economic and Social Implications. A.R.H.

N77-31027# Decisions and Designs, Inc., McLean, Va.
CRISIS FORECASTING AND CRISIS: A CRITICAL EXAMINATION OF THE LITERATURE Technical Report, 1 Jan. - 30 Sep. 1976
Richard W. Parker Dec. 1976 68 p refs
(Contract N00014-76-C-0712)
(AD-A039458; TR-76-21) Avail: NTIS HC A04/MF A01 CSCL 05/4

Crisis research, forecasting research, and crisis forecasting. After the literature in each area was examined, critical evaluation was conducted with the following conclusions: (1) crisis research has been of use to applied crisis forecasting by providing useful generalizations about behavior; (2) forecasting methods are well suited to crisis forecasting data although much work needs to be done before sophisticated techniques such as econometrics and subjective methods can be used; and (3) crisis forecasting research has been specific in country focus and conducted in the context of specific time frames and is thus useful to future applied crisis forecasting. GRA

85 URBAN TECHNOLOGY AND TRANSPORTATION

Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.

For related information see *03 Air Transportation and Safety*, *16 Space Transportation*, and *44 Energy Production and Conversion*.

N77-31028# Bendix Corp., Kansas City, Mo.
REFLECTED LIGHT INTENSITY DISTRIBUTIONS FROM DEFECTS ON HIGHLY REFLECTIVE SPHERES, REVISED
P. E. Klingsporn Feb. 1977 45 p refs Revised
(Contract EX-76-C-04-0613)
(BDX-613-1174(Rev)) Avail: NTIS HC A03/MF A01

A light reflection technique suitable for development into an automated surface quality certification system was investigated to determine if reflected light intensity distributions could be correlated with surface defect depths. Reflected laser light intensity distributions from pit and scratch defects on highly reflective spheres were studied with a commercial multi-element photodetector. It was found that the intensity distributions could be correlated with depths of pits and scratches in a size range of concern on highly reflective spheres. ERA

N77-31029# Worcester Polytechnic Inst., Mass. Dept. of Civil Engineering.
CAPACITY PLANNING FOR REGIONAL WASTEWATER TREATMENT SYSTEMS Final Report
Lewis A. Rossman Apr. 1977 143 p refs
(Grant NSF ENG-75-10307)
(PB-267554/4; WPI/CE-77/1) Avail: NTIS HC A07/MF A01 CSCL 13B

An economic optimization model and associated computer program are developed for determining facility locations, interceptor routes, and capacity expansion schedules in a least cost regional wastewater treatment system. The model explicitly considers the interaction between facility location and capacity expansion decisions on total system cost. The model is solved with a three phase heuristic procedure which makes strong use of dynamic programming. In comparisons with a mixed integer programming model on a large scale problem the heuristic approach demonstrates significant advantages in terms of computational time, accuracy, and user requirements. GRA

N77-31030# Control Data Corp., Rockville, Md.
TRENDS IN BUS TRANSIT OPERATIONS, 1960 - 1974 Final Report
Jan. 1977 134 p ref Prepared in cooperation with Wells Research Co., Silver Spring, Md.
(Contract DOT-OS-60012)
(PB-266748/3; DOT-TRI-77-14) Avail: NTIS HC A07/MF A01 CSCL 13B

The historical patterns of bus transit operations from 1960 to 1974 using data from 50 bus operations were analyzed. The various trends examined are patronage, supply of services, resources employed, revenues, costs, utilization of employees and vehicles, and fuel consumption. GRA

N77-31031# Federal Highway Administration, Washington, D.C. Office of Traffic Operations.
IMPROVING THE HIGHWAY SYSTEM BY UPGRADING AND OPTIMIZING TRAFFIC CONTROL DEVICES Final Report
Harold Lunenfeld Apr. 1977 77 p refs
(PB-266987/7; FHWA-TO-77-1) Avail: NTIS HC A05/MF A01 CSCL 13B

Upgrading and optimizing the highway information system was evaluated in terms of human factors, safety, benefit-cost, and traffic engineering. It was found that those portions of the highway system not in compliance with the Manual on Uniform Traffic Control Devices (MUTCD) would experience significant safety benefits and improved system efficiency through upgrading to current standards. Among the factors leading to this conclusion are: (1) Traffic control device deficiencies can lead to driver error and accidents; (2) roads with the lowest level of MUTCD compliance generally experience disproportionately high accident rates; (3) studies show significant positive safety and efficiency benefits and driver error reductions with traffic control devices improvements; (4) if optimizing the total information system reduced accidents by 10 percent, a benefit-cost ratio of from 10:1 to 20:1 would be realized. It was recommended that emphasis be given to upgrading all traffic control devices to MUTCD standards and optimizing through positive guidance. GRA

N77-31032# Oklahoma Univ., Norman. Office of Research Administration.
AN URBAN MODEL FOR THE EVALUATION OF ALTERNATIVE GROWTH POLICIES Final Report
George W. Reid, Joseph F. Lawrence, and Sils Y. A. Law 1975 270 p refs
(Grant NSF SSH-71-02171-A02)
(PB-266911/7; NSF/RA/S-75-072) Avail: NTIS HC A02/MF A01 CSCL 13B

The feasibility of modeling an urban system using an interdisciplinary group is demonstrated. Real world urban problems in a real world environment are examined. The models are intended as aids to the urban environment related decision process. They provide balanced needs as inputs to public sector functional programs. GRA

N77-31033# Dyer (Thomas E.), Inc., Lexington, Mass.
RAIL TRANSIT SYSTEM COST STUDY Final Report, May 1974 - Jul. 1975
Thomas K. Dyer, W. K. Hale, F. A. Ingalls, and R. B. Whelan Mar. 1977 120 p
(Contract DOT-TSC-808)
(PB-266918/2; UMTA-MA-06-0025-77-12; DOT-TSC-UMTA-75-22-Rev-1) Avail: NTIS HC A06/MF A01 CSCL 13B

The cost of constructing, operating and maintaining three kinds of urban rail systems, light rail, rapid rail and commuter rail was assessed. Cost data from several North American and European transit authorities were collected and analyzed. These data, together with recent experience of the consultant in several transit construction projects, served as the basis of the cost projections. Factors influencing appreciable cost variations in construction and operations were reviewed and included as criteria for cost projections. GRA

N77-31034# Harvard Univ., Cambridge, Mass.
IMPROVING URBAN MASS TRANSPORTATION PRODUCTIVITY Final Report

John R. Meyer and Jose A. Gomez-Ibanez Feb. 1977 231 p refs
(Contract DOT-MA-11-0026)
(PB-266920/8; UMTA-MA-11-0026-77-1) Avail: NTIS HC A11/MF A01 CSCL 13B

The importance of productivity improvement to the transit industry is assessed. Topics discussed include the steady decline in transit ridership, the industry's deficits, and growing dependence on public subsidies. Opportunities to improve productivity in the attempt to reverse ridership decline and subsidy dependence growth are identified. GRA

N77-31035# Oklahoma State Univ., Stillwater.
TRANSFERRING ENVIRONMENTAL TECHNOLOGY TO LOCAL LEADERS
Robert Fite, Mark Gregory, and Herman Jones Jan. 1977 121 p refs
(Grant NSF RD-175-19607)
(PB-266838/2; NSF/RA-770052) Avail: NTIS HC A06/MF A01 CSCL 13B

A system was developed for delivering environmental research results to local government officials and other community leaders using the Cooperative Extension Service as a transfer vehicle. A slide-tape package dealing with the increasing problem of contaminants in public drinking water supplies and regulations established to correct this health hazard was shown in 77 counties. An educational package was developed to help cities and towns comply with the water pollution control requirements prescribed by Public Law 92-500, which encourages consideration of land application of municipal wastewaters as a means of disposal and treatment. GRA

N77-31036# Environmental Protection Agency, Washington, D. C. Div. of Stationary Source Environment.
COMPLIANCE STATUS OF MAJOR AIR POLLUTION FACILITIES Final Report
May 1977 565 p refs
(PB-266785/5; EPA-340/1-77-011) Avail: NTIS HC A24/MF A01 CSCL 13B

The probable compliance status and related facility information for major stationary sources of air pollution is presented. The contents of this report were generated from the U.S. Environmental Protection Agency's Compliance Data System and are not intended to represent the true legal status of facilities with respect to applicable air pollution regulations but rather those facilities of interest to the states or the Agency for further investigation. GRA

N77-31037# Texas Transportation Inst., College Station.
CORRIDOR ANALYSIS FOR LEVEL OF SERVICE DESIGN Final Report, Sep. 1972 - Aug. 1975
N. J. Rowan and Donald A. Anderson Aug. 1975 60 p ref Sponsored in part by Federal Highway Admin. and Texas State Dept. of Highways and Public Transportation
(PB-266957/0; TTI-2-10-73-30-3F) Avail: NTIS HC A04/MF A01 CSCL 13B

Methods are described for improving the process of designing transportation corridor facilities. The current design recommendation process is identified and evaluated. Other topics include functional classification, qualitative measures of traffic service, and the effects of mid-block access on traffic operations. GRA

N77-31038# Interplan Corp., Santa Barbara, Calif.
TRANSPORTATION SYSTEM MANAGEMENT: STATE-OF-THE-ART Final Report
Barbara I. Keyani and Evelyn S. Putnam Feb. 1977 207 p refs
(UMTA Proj. RI-06-0008)
(PB-266953/9; UMTA-RI-06-0008-77-1; Rept-7504-R) Avail: NTIS HC A10/MF A01 CSCL 13B

Thirty-one specific transportation management system actions for improving air quality, conserving energy, and increasing transportation efficiency and mobility in urban areas with populations greater than 50,000 are documented. Included are examples of successful experience, advantages and disadvantages, guideline conditions concerning implementation, the range of costs involved, and interrelationships with the other actions. GRA

N77-31039# Environmental Protection Agency, Washington, D.C. Municipal Construction Div.
USA/USSR SYMPOSIUM ON INTENSIFICATION OF BIO-CHEMICAL TREATMENT OF WASTEWATERS (3RD)
Aug. 1976 92 p refs Symp. held at Moscow, 23-24 Aug. 1976; sponsored by USA-USSR Working Group on the Prevention of Water Pollution from Municipal and Industrial Sources
(PB-266703/8) Avail: NTIS HC A05/MF A01 CSCL 13B

The third cooperative USA/USSR symposium on the intensification of biochemical treatment of wastewaters from municipal and industrial sources was held in Moscow U.S.S.R. at the Vodgeo headquarters. The fifteen papers that were presented are reprinted in English in this volume. GRA

N77-31040*# Chemtric, Inc., Rosemont, Ill.
DEVELOPING AND TESTING OF A WASTEWATER RECYCLER AND HEATER
Victor J. Guarino and Robert A. Bambanek Dec. 1976 106 p Sponsored in part by NASA, Army Med. Res. and Develop. Comm. HUD, and Coast Guard
(Contract EPA-68-03-0436)
(NASA-CR-154846; PB-266961/2; EPA-600/2-76-289) Avail: NTIS HC A06/MF A01 CSCL 13B

The feasibility of an automatic and self-contained appliance that can recover and store usable hot water from waste laundry water, using essentially the same amount of energy as an equivalent-capacity water heater was demonstrated. It was shown by extended evaluation tests with a waste stream of real laundry water that this unit is capable of recovering sterile hot water at a steady state rate of 22.7 liters/hour with a specific energy draw of 79 watt-hours/liters without the use of any expendable chemicals. Author (GRA)

N77-31041# General Technical Services, Inc., Upper Darby, Pa.
SYSTEMS MODELS FOR TRANSPORTATION PROBLEMS. VOLUME 1: INTRODUCING A SYSTEMS SCIENCE FOR TRANSPORTATION PLANNING Final Report, Oct. 1974 - Mar. 1975
A. S. Iberall and S. Z. Cardon Mar. 1976 82 p refs 4 Vol.
(Contract DOT-TSC-946)
(PB-267428/1; DOT-TSC-OST-76-12.1) Avail: NTIS HC A05/MF A01 CSCL 13B

Urban transportation problems were examined through the development of physically based systems models. Physical principles of statistical mechanics and irreversible thermodynamics were utilized. A foundation was laid on how statistical mechanics, equilibrium thermodynamics, and near equilibrium thermodynamics are used for systems other than the atoms and molecules of their standard applications. GRA

N77-31042# General Technical Services, Inc., Upper Darby, Pa.
SYSTEMS MODELS FOR TRANSPORTATION PROBLEMS. VOLUME 2: AN INTRODUCTION TO URBAN CENTER MODELING Final Report, Mar. - Jul. 1975
A. S. Iberall and S. Z. Cardon Mar. 1976 46 p refs 4 Vol.
(Contract DOT-TSC-946)
(PB-267429/9; DOT-TSC-OST-76-12.2) Avail: NTIS HC A03/MF A01 CSCL 13B

The problem of formalizing a model for transportation planning in an urban economy was considered from a thermodynamic theory viewpoint. Technical notions were built toward a model leading to experimental testing in the real system. Primitives for an urban system information flow policy model based on a two time scale controller were developed. GRA

N77-31043# General Technical Services, Inc., Upper Darby, Pa.
SYSTEMS MODELS FOR TRANSPORTATATION PROBLEMS. VOLUME 3: A COMPUTABLE COMMAND-CONTROL SYSTEM FOR A SOCIAL SYSTEM Final Report, Jul. - Aug. 1975
A. S. Iberall and S. Z. Cardon Mar. 1976 90 p refs 4 Vol.
(Contract DOT-TSC-946)
(PB-267430/7; DOT-TSC-OST-76-12.3) Avail: NTIS HC A05/MF A01 CSCL 13B

Spectral characteristics of the urban center at the level of

the family, the functional organized units of society and the essential compartment balances of the urban center, are discussed in detail. These compartments are food, materials, energetics, manpower, productive function, economic balance, and technology governing the system. Ideal Carnot cyclic efficiencies are characterized for the basic cyclic processes in each compartment. GRA

N77-31044# General Technical Services, Inc., Upper Darby, Pa.
SYSTEMS MODELS FOR TRANSPORTATION PROBLEMS. VOLUME 4: THE DEVELOPMENT OF URBAN DYNAMICS AND ITS POSSIBLE REGULATION Final Report, Aug. - Nov. 1975
A. S. Iberall and S. Z. Cardon Mar. 1976 132 p refs 4 Vol. (Contract DOT-TSC-946)
(PB-267431/5; DOT-TSC-OST-76-12.4) Avail: NTIS HC A07/MF A01 CSCL 13B

Physics of society were used for regulation and control as applied to transportation design. Kinds of extant modeling were reviewed and a hard social physics was outlined. A theory was developed for the thermostatic states of complex systems using the United States and some American cities. Underlying potentials that govern the spatial character of a settlement were outlined and a theory of technological growth was proposed. GRA

N77-31045# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Environmental Science Engineering.
HIGH GRADIENT MAGNETIC SEPARATION OF FOOD PROCESSING WASTEWATER M.S. Thesis
Julie A. Petruska Mar. 1977 102 p refs
(PB-267440/6; W77-07852) Avail: NTIS HC A06/MF A01 CSCL 06H

The amenability of food processing wastewater to treatment by high gradient magnetic separation was studied. Soluble organic removal was also accomplished by use of activated carbon adsorption. The studies with known concentrations of soluble starch revealed that although adsorption of the starch could be accomplished, the removal of the activated carbon in the magnetic separator was inefficient. Parameters such as color plus turbidity, chemical oxygen demand, total phosphorus, and solids were monitored and reductions in these parameters after magnetic treatment were noted. GRA

N77-31046# Bureau of Mines, College Park, Md. Metallurgy Research Center.
AN ECONOMIC EVALUATION OF A PROCESS TO SEPARATE RAW URBAN REFUSE INTO ITS METAL, MINERAL, AND ENERGY COMPONENTS
Thomas A. Phillips 1977 32 p refs
(PB-267629/4; BM-IC-8732) Avail: NTIS HC A03/MF A01 CSCL 13B

An economic assessment of the Bureau of Mines process for the separation and recovery of ferrous metal, mixed nonferrous metals, aluminum, mixed-color glass cullet, and refuse derived fuel products from raw refuse was made for a plant capable of processing 1,000 tons per day of raw urban refuse operating 2 shifts, 6 days per week. The fixed capital cost, based on second quarter 1976 equipment costs is $14,529,600 excluding land and shipping facilities. Credit for the products is not included in the estimated operating cost of $7.96 per ton of refuse processed; nor are taxes or fees for tipping, dumping, transportation or financing. GRA

N77-31047# Case Western Reserve Univ., Cleveland, Ohio.
HIERARCHICAL PLANNING AND MANAGEMENT OF A TOTAL REGIONAL WATER RESOURCE SYSTEM: JOINT CONSIDERATION OF THE SUPPLY AND QUALITY OF GROUND AND SURFACE WATER RESOURCES
Yacov Y. Haimes Aug. 1976 314 p refs Prepared for Ohio State Univ., Columbus
(OWRT Proj. B-062-Ohio(1))
(PB-267293/9; W77-07793) Avail: NTIS HC A15/MF A01 CSCL 13B

A planning and management methodology for a regional water quality control is presented. The planning framework is developed based on a multiobjective analysis in order to take into consideration the conflicting objectives of surface water quality and the cost of expansion and operation of wastewater treatment plants. GRA

N77-30280*# IIT Research Inst., Chicago, Ill.
INDUSTRIAL BENEFITS AND FUTURE EXPECTATIONS IN MATERIALS AND PROCESSES RESULTING FROM SPACE TECHNOLOGY
John D. Meyer *In* NASA. Marshall Space Flight Center Proc. of the ASPE/MSFC Symp. and Productivity Gains from Space Technol. May 1977 p 129-135 (For primary document see N77-30273 21-31)
Avail: NTIS HC A13/MF A01 CSCL 05B

88 SPACE SCIENCES (GENERAL)

N77-31048# White House, Washington, D. C.
AERONAUTICS AND SPACE REPORT OF THE PRESIDENT. 1976 ACTIVITIES
[1977] 113 p
Avail: NTIS MF A01; SOD HC

The development and utilization of aeronautical and aerospace technologies by various U.S. agencies and scientific organizations during the bicentennial year are summarized. Appendices list U.S. spacecraft records from 1957, successful launches in 1976, the history of U.S. and Soviet manned space flights, U.S. launch vehicles, and various space budgets. A.R.H.

89 ASTRONOMY

Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

N77-31049 Columbia Univ., New York.
PROPERTIES AND ENERGY TRANSPORT OF NEUTRON STAR SURFACES Ph.D. Thesis
Jin-Fuw Lee 1976 238 p
Avail: Univ. Microfilms Order No. 77-8869

The huge magnetic fields characteristic of neutron star surface, have a dominant influence over the composition of matter in the crust. The huge magnetic force constrains the motion of electrons in the plane perpendicular to B (infinite) which leads to the formation of tightly-bound cigar-shaped atoms. The binding energies of these cylindrical atoms, molecular chains and condensed solid lattice are calculated using the standard Hartree-Fock variational method. With the use of exact Landau wave functions in the directions perpendicular to B (infinite), and appropriate trial wave functions parallel to B (infinite), an upper bound for ground state energies is estimated.
Dissert. Abstr.

N77-31050 Indiana Univ., Bloomington.
UBVI SURFACE PHOTOMETRY OF THE ANDROMEDA SPIRAL GALAXY, M31 Ph.D. Thesis
Roger Dean Burgess 1976 233 p
Avail: Univ. Microfilms Order No. 77-10917

Photoelectric drift scans were used to study various regions of the Andromeda Spiral Galaxy, M31, through a range in brightness covering ten magnitudes from the bright semistellar nucleus out to a radial rectified distance of 115 arcmin. The M31 surface photometry in UBV of the bright spiral region using the drift scanning technique has resulted in a series of luminosity profiles at declinations ranging from + 40 deg 18 min to + 41 deg 46 min [1970.0]. From the photoelectric data, computer generated contour maps have been constructed in all colors. The maps appear to conform to the observed optical patterns in the fragmented spiral structure of the galaxy.
Dissert. Abstr.

N77-31051 Maryland Univ., College Park.
NUCLEOSYNTHESIS IN RED GIANT STARS Ph.D. Thesis
John James Cowan 1976 106 p

Avail: Univ. Microfilms Order No. 77-9501

High temperature CNO cycle burning was studied. An overabundance of both O-17 and O-18 after times of approximately 100 seconds was observed. For temperatures of 150 and 200 million degree O-18 abundance was much larger than O-17 abundance after burning times of about 1000 seconds. Effects of mixing amounts of hydrogen rich material into the intershell convection region of red giants undergoing helium shell flashes were examined. A neutron number density in the intershell region indicated an intermediate neutron process may operate in evolved red giants. Dissert. Abstr.

N77-31052 Dartmouth Coll., Hanover, N.H.
SPECTROPHOTOMETRY OF HDE 226868 (CYGNUS X-1) Ph.D. Thesis
John William Cook 1977 281 p ref
Avail: Univ. Microfilms Order No. 77-11166

Spectra of HDE 226868, the optical counterpart of the X-ray source Cygnus X-1, were obtained at a dispersion of approximately 84 A/mm. Plates were scanned on a microdensitometer and the resulting density measurements converted to relative intensities using standard photometric calibration methods. The resulting spectra, representing a region from redward of H alpha to blueward of H delta, were reduced to rectified spectra in continuum units. Selected lines were examined, and the line profiles and equivalent widths obtained. The equivalent widths of hydrogen and helium absorption lines appear consistent with a normal 09.7 lab star. Parameters of the Cygnus X-1 system are calculated and a qualitative model for the optical behavior examined. The difficulties in determining electron temperature and density in the region of optical emission are discussed. Dissert. Abstr.

N77-31053 Indiana Univ., Bloomington.
NUCLEOSYNTHESIS DURING THE EVOLUTION OF HYDROGEN-HELIUM STARS Ph.D. Thesis
John Gordon Eoll 1976 337 p refs
Avail: Univ. Microfilms Order No. 77-10920

A stellar evolution computer program was modified to include two levels of nuclear reactions and a scheme to treat semiconvective mixing in order to follow the compositional evolution of four different hydrogen-helium stars from the zero-age main sequence through the stages of core hydrogen and, where possible, core helium burning. From the onset of core helium burning the cores of these stars behave nearly the same as for stars of normal composition. The one unique feature occurs during the earlier core hydrogen burning phase. The pre-detonation configurations were characterized by near normal composition interior to the helium burning shell (although nitrogen burning products were deficient), while above this point the neutron to proton ratio was depressed below the normally encountered values. Dissert. Abstr.

N77-31054*# National Aeronautics and Space Administration. Goddard Inst. for Space Studies, New York.
A STUDY OF THE LUMINOSITY FUNCTION FOR FIELD GALAXIES
James E. Felten Jul. 1977 55 p refs Submitted for publication
(NASA-TM-X-71365; X-602-77-162) Avail: NTIS HC A04/MF A01 CSCL 03A

Nine determinations of the luminosity function (LF) for field galaxies are analyzed and compared. Corrections for differences in Hubble constants, magnitude systems, galactic absorption functions, and definitions of the LF are necessary prior to comparison. Errors in previous comparisons are pointed out. After these corrections, eight of the nine determinations are in fairly good agreement. The discrepancy in the ninth appears to be mainly an incompleteness effect. The LF data suggest that there is little if any distinction between field galaxies and those in small groups. Author

90 ASTROPHYSICS

Includes cosmology; and interstellar and interplanetary gases and dust.

N77-31055 Indiana Univ., Bloomington.
EFFECT OF OUTER BOUNDARY CONDITIONS ON THE EVOLUTION OF INTERMEDIATE-MASS STARS Ph.D. Thesis
Rodney Wayne Whitaker 1976 119 p
Avail: Univ. Microfilms Order No. 77-10952

Problems addressed in studying the physical conditions in the outer layers of the stellar envelope include more realistic radiative transfer in the optically thin regions, and the absence of molecular sources of opacity in the standard tabulations of the Rosseland mean absorption coefficient. Improved boundary outer boundary conditions were applied to the giant-branch evolution of stars of 3 and 5 solar masses. A 5 solar mass sequence was computed in which the outer boundary conditions were generated with diffusion envelopes which included molecular opacity in the computation of the Rosseland mean absorption coefficient. This sequence agreed very well with the improved outer boundary 5 solar mass sequence. This result indicates that diffusion envelopes can provide good outer boundary conditions for 5 solar mass stars if molecular sources of opacity are considered in the calculation of the Rosseland mean absorption coefficient. Dissert. Abstr.

N77-31056*# Lockheed Electronics Co., Houston, Tex. Aerospace Systems Div.
INSTANTANEOUS RELATIONSHIP BETWEEN SOLAR INERTIAL AND LOCAL VERTICAL LOCAL HORIZONTAL ATTITUDES
Stephanie A. Vickery Jun. 1977 17 p
(Contract NAS9-15200)
(NASA-CR-151489; LEC-10711; JSC-12637) Avail: NTIS HC A02/MF A01 CSCL 03B

The instantaneous relationship between the Solar Inertial (SI) and Local Vertical Local Horizontal (LVLH) coordinate systems is derived. A method is presented for computation of the LVLH to SI rotational transformation matrix as a function of an input LVLH attitude and the corresponding look angles to the sun. Logic is provided for conversion between LVLH and SI attitudes expressed in terms of a pitch, yaw, roll Euler sequence. Documentation is included for a program which implements the logic on the Hewlett-Packard 97 programmable calculator. Author

N77-31057*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ON THE EXISTENCE OF FINITE AMPLITUDE, TRANSVERSE ALFVEN WAVES IN THE INTERPLANETARY MAGNETIC FIELD
James W. Sari Jul. 1977 12 p refs Submitted for publication
(NASA-TM-X-71375; X-692-77-170) Avail: NTIS HC A02/MF A01 CSCL 03B

Interplanetary magnetic field data from the Mariner 10 spacecraft were examined for evidence of small and finite amplitude transverse Alfven waves, general finite amplitude Alfven waves, and magnetosonic waves. No evidence for transverse Alfven waves was found. Instead, the field fluctuations were found to be dominated by the general finite amplitude Alfven wave. Such wave modes correspond to non-plane-wave solutions of the nonlinear magnetohydrodynamic equations. Author

91 LUNAR AND PLANETARY EXPLORATION

Includes planetology; and manned and unmanned flights.

For spacecraft design see *18 Spacecraft Design Testing, and Performance*. For space stations see *15 Launch Vehicles and Space Vehicles*.

N77-31058 Pennsylvania State Univ., University Park.
THE ATMOSPHERE OF JUPITER: EXPERIMENTAL FORMATION OF JOVIAN COLORS Ph.D. Thesis
Floyd E. Miller, Jr. 1976 85 p
Avail: Univ. Microfilms Order No. 77-9576

The physical properties of binary and ternary mixtures of Jovian atmospheric constituents were investigated with the aim of increasing knowledge about the visible surface of Jupiter. Conditions of pressure, temperature, and composition that were good approximations of currently accepted Jovian atmospheric data were used. Solid and liquid phases were formed during these experiments and preliminary data regarding their formation were collected and analyzed. Results indicate that several colors can be seen in the liquid and solid phases which were derived from Jovian atmospheric constituents at relevant pressures, temperatures, and compositions. These colors were very similar to colors observed on Jupiter by telescopic means and by the imaging photopolarimeters of Pioneers 10 and 11.
Dissert. Abstr.

N77-31059*# Lamont-Doherty Geological Observatory, Palisades, N. Y.
COMPREHENSIVE STUDY OF THERMAL PROPERTIES OF LUNAR CORE SAMPLES Final Technical Report, 1 Feb. 1972 - 1 Jun. 1975
M. G. Langseth and K. Horath 1 Jun. 1975 17 p
(Grant NGR-33-008-169)
(NASA-CR-153405) Avail: NTIS HC A02/MF A01 CSCL 03B

The feasibility of a technique for measuring the thermal conductivity of lunar core samples was investigated. The thermal conduction equation for a composite cylinder was solved to obtain a mathematical expression for the surface temperature of the core tube filled with lunar material. The sample is heated by radiation from the outside at a known rate, the variation of the temperature at the surface of the core tube is measured, and the thermal conductivity determined by comparing the observed temperature with the theoretically expected one. The apparatus used in the experiment is described. Author

92 SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots.

N77-31060 California Inst. of Tech., Pasadena.
THE MAGNETIC HISTORY OF SOLAR ACTIVE REGIONS Ph.D. Thesis
James Marshall Mosher 1977 299 p
Avail: Univ. Microfilms Order No. 77-10471

Recent magnetic observations to trace the history of a typical solar active region from birth to death. By comparing the short term motions to the long term spreading, it was demonstrated that the decay process was dominated by a random walk of field lines, with a diffusion constant of roughly 200 to 400 sq km.sec. The interaction between diffusion and differential rotation dictated the geometric pattern of the decaying region. The actual quantity of surviving flux was less, and its ultimate annihilation more thorough, than was expected. Dissert. Abstr.

N77-31061 New Hampshire Univ., Durham.
SOLAR ENERGETIC PARTICLE PROPAGATION FROM 1 TO 5 AU Ph.D. Thesis
Ronald Dean Zwickl 1976 230 p
Avail: Univ. Microfilms Order No. 77-10267

An analysis of solar particle events, observed by the charged particle detector on board Pioneer 10 and Pioneer 11 is carried out with the goal of experimentally determining the statistical average interplanetary propagation conditions from 3 to 30 MeV. A numerical propagation model was developed that includes diffusion, convection, adiabatic deceleration, and a variable coronal injection profile. A statistical analysis of the entire data set was carried out by individually analyzing each of the parameters that are uniquely defined in a solar particle event. The statistical average radial interplanetary diffusion coefficient from 1 to 5 AU and from 3 to 30 MeV was found to be both independent of radial distance and approximately independent of rigidity. The above diffusion coefficients are inconsistent with both the predictions of the diffusion coefficient from present theoretical transport models and with the diffusion coefficient used in modulation studies at low energies. Dissert. Abstr.

N77-31062*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
IMPULSIVE SOLAR X-RAY BURSTS
Carol Jo Crannell, Kenneth J. Frost, Christian Maetzler, Kenichiro Ohki, and Jack L. Saba (Computer Sciences Corp., Los Angeles) Aug. 1977 76 p refs Submitted for publication
(NASA-TM-X-71379; X-684-77-202) Avail: NTIS HC A05/MF A01 CSCL 03B

A set of 22 simple, impulsive solar flares, identified in the OSO-5 hard X-ray data, were analyzed together with coincident microwave and meterwave radio observations. The rise times and fall times of the X-ray bursts are found to be highly correlated and effectively equal, strongly suggesting a flare energizing mechanism that is reversible. The good time resolution available for these observations reveals that the microwave emission is influenced by an additional process, evident in the tendency of the microwave emission to peak later and decay more slowly than the symmetric X-ray bursts. Meterwave emission is observed in coincidence with the 5 events which show the strongest time correlation between the X-ray and microwave burst structure. This meterwave emission is characterized by U-burst radiation, indicating confinement of the flare source. Author

N77-31063*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ADIABATIC HEATING IN IMPULSIVE SOLAR FLARES
Christian Maetzler, Taeil Bai, Carol Jo. Crannell, and Kenneth J. Frost Aug. 1977 35 p refs Submitted for publication
(Grant NGR-21-002-316)
(NASA-TM-X-71380; X-660-77-203) Avail: NTIS HC A03/MF A01 CSCL 03B

The dynamic X-ray spectra of two simple, impulsive solar flares are examined together with H alpha, microwave and meter wave radio observations. X-ray spectra of both events were characteristic of thermal bremsstrahlung from single temperature plasmas. The symmetry between rise and fall was found to hold for the temperature and emission measure. The relationship between temperature and emission measure was that of an adiabatic compression followed by adiabatic expansion; the adiabatic index of 5/3 indicated that the electron distribution remained isotropic. Observations in H alpha provided further evidence for compressive energy transfer. Author

N77-31064# Ceskoslovenska Akademie Ved, Prague. Astronomical Inst.
SOLAR PROTON FLARES AND THEIR PREDICTION
Ladislav Krivsky 1977 121 p refs
(Publ-52) Avail: NTIS HC A06/MF A01

Solar flares and their effects were studied. The forecasting of flares a few days in advance with fast proton emissions was presented. A catalog of proton flares from 1942 to 1976 is also included. Author

N77-30522*# Energy Research and Development Administration, Washington, D.C. Div. of Solar Energy.
MONITORING SOLAR RADIATION: THE ERDA PROGRAM
Frederick A. Koomanoff and Michael R. Riches *In* NASA. Lewis Res. Center Terrest. Photovoltaic Meas., 2 1976 p 1-17 refs (For primary document see N77-30521 21-42)
Avail: NTIS HC A17/MF A01 CSCL 03B

N77-30523*# Delaware Univ., Newark.
THE SOLAR SPECTRUM AT TYPICAL CLEAR WEATHER DAYS
K. W. Boer *In* NASA. Lewis Res. Center Terrest. Photovoltaic Meas., 2 1976 p 17-58 refs (For primary document see N77-30521 21-42)
Avail: NTIS HC A17/MF A01 CSCL 03B

N77-30524*# Delaware Univ., Newark. Inst. of Energy Conversion.
INSOLATION MEASUREMENTS WITH A PORTABLE CuS-CdS RADIOMETER
H. M. Windawi *In* NASA. Lewis Res. Center Terrest. Photovoltaic Meas., 2 1976 p 59-66 refs (For primary document see N77-30521 21-42)
(Grant NSF AER-72-03478)
Avail: NTIS HC A17/MF A01 CSCL 03B

N77-30533*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
SOME BASIC CONSIDERATIONS OF MEASUREMENTS INVOLVING COLLIMATED DIRECT SUNLIGHT
An-Ti Chai *In its* Terrest. Photovoltaic Meas., 2 1976 p 233-246 refs Previously announced as N77-26622 (For primary document see N77-30521 21-42)
Avail: NTIS HC A17/MF A01 CSCL 03B

93 SPACE RADIATION

Includes cosmic radiation and inner and outer earth's radiation belts.

For biological effects of radiation see *52 Aerospace Medicine*. For theory see *73 Nuclear and High-Energy Physics*.

N77-31065 Maryland Univ., College Park.
THE GENERATION OF PULSED EMISSION FROM ROTATING NEUTRON STARS BY PLASMA STREAMING INSTABILITIES Ph.D. Thesis
Philip Edward Hardee 1976 165 p
Avail: Univ. Microfilms Order No. 77-10272

Pulsed emission observed from magnetized rotating neutron stars was studied. Collective effects caused by a high energy electron-positron beam traversing a low energy electron-positron plasma were investigated for parameters appropriate to pulsar magnetospheres. Instabilities that result from such a particle distribution were identified. Dissert. Abstr.

N77-31066 Maryland Univ., College Park.
SPECTRA OF COSMIC RAY HADRONS BETWEEN 100 AND 10000 GeV AT ATMOSPHERIC DEPTHS OF 730 AND 1030 g/sq cm Ph.D. Thesis
Francois Siohan 1976 499 p
Avail: Univ. Microfilms Order No. 77-10424

Hadron fluxes in the atmosphere were measured at sea level and at an altitude of 2,900 meters, in the energy range between 100 to 10,000 GeV. A lower bound to the inelastic proton air cross section was obtained. Hadron energies were measured with 15 percent resolution by a 1,000 g. per sq cm deep, seven layers, iron-liquid scintillator calorimeter. The fraction of visible energy in this calorimeter is 60 + or - 5 percent for hadrons. The visible energy fraction for electromagnetic cascades (transition effect) was obtained as 81 + or - 8%. With systematic uncertainties of 20 percent, the differential vertical intensity of charged hadrons unaccompanied over 3.3 sq. m. has been measured at sea level between 300 and 1200 GeV and at a depth of 730 g. per sq. cm between 100 and 10,000 GeV: Using the known flux composition for unaccompanied hadrons and other experimental data a lower bound to the inelastic proton-air cross section was obtained. Dissert. Abstr.

N77-31067*# National Aeronautics and Space Administration. Goddard Inst. for Space Studies, New York.
NONTHERMAL GALACTIC EMISSION BELOW 10 MHZ
James C. Novaco and Larry W. Brown Jul. 1977 33 p refs (NASA-TM-X-71363; X-693-77-159) Avail: NTIS HC A03/MF A01 CSCL 03B

The Radio Astronomy Explorer-2 (RAE-2) satellite has provided new measurements of the nonthermal galactic radio emission at frequencies below 10 MHz. Measurements of the emission spectra are presented for the center, anticenter, north polar, and south polar directions at 22 frequencies between 0.25 and 9.18 MHz. Survey maps of the spatial distribution of the observed low frequency galactic emission at 1.31, 2.20, 3.93, 4.70, 6.55, and 9.18 MHz are presented. The observations were obtained with the 229-meter traveling-wave V-antenna on this lunar orbiting spacecraft. The improved frequency coverage offers additional insights into structure of the local galactic neighborhood. Author

N77-31068# Academy of Sciences (USSR), Moscow. Space Research Institute.
ON DETECTION OF HEAVY IONS IN THE REGION OF SOLAR WIND INTERACTION WITH MARS
V. Bezrukikh, M. Verigin, and N. Shutte 1977 17 p refs (PR-333) Avail: NTIS HC A02/MF A01

The operation of the RIEP instrument onboard the Mars 5 space probe was analyzed to test the previously made hypothesis that the data on ion fluxes obtained by the instrument can be interpreted as detection of heavy ion fluxes in the region where the solar wind interacts with Mars. The analysis indicates that all the typical features of the experimental data can be explained if ions of only one mass are present in this region, and the hypothesis on the existence of heavy ion fluxes is not required for their explanation. Author

N77-31069*# Lockheed Electronics Co., Houston, Tex. Systems and Services Div.
TRASYS: CHECKOUT OF ACCURACY OF DIRECT IRRADIATION CALCULATIONS FOR DISCS, TRAPEZOIDS, CONES, AND CIRCULAR PARABOLOIDS
R. C. Mackeen Jul. 1977 61 p refs
(Contract NAS9-15200)
(NASA-CR-151504; LEC-10658; JSC-12648; TR-7002) Avail: NTIS HC A04/MF A01 CSCL 03B

Results of the direct irradiation link of the TRASYS program are evaluated. Several surface configurations were investigated. The accuracy of the results was examined for simple cases where the answers were analytically known. By varying an accuracy factor in the program, the amount of computer time needed to achieve different degress of accuracy was determined. Author

99 GENERAL

No abstracts in this category.

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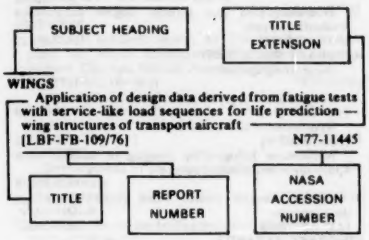

The subject heading is the key to the subject content of the document. Titles, report numbers, and accession numbers of pertinent documents are provided under each subject heading. When the title is insufficiently descriptive of the document content, a title extension has been added, separated from the title by three hyphens. The report number helps to indicate the type of document cited (e.g., NASA report, NASA translation, NASA contractor report). The NASA accession number is the number by which the document abstracts are arranged in this journal and by which the document is sold or requested. The titles, with title extensions if present, are arranged under each subject heading in ascending accession number order. The subject headings have been selected from the latest revision of the *NASA Thesaurus* (NASA SP-7050).

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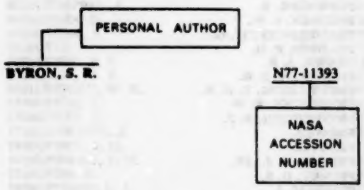

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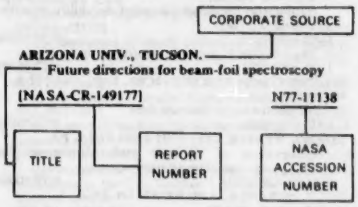

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The application of ERTS imagery to the FAO/Unesco soil map of the world
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GCA CORP., BEDFORD, MASS.
National assessment of the urban particulate problem. Volume 7: Washington, D. C.
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Development of thermochemical water splitting for hydrogen production at general atomic company
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[PB-267429/9] N77-31042
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Water resources data for Iowa. Water year 1976
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Water-management models in Florida from ERTS-1 data
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GOLD [ROBERT] ASSOCIATES, LOS ANGELES, CALIF.
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LEAR SIEGLER, INC., SANTA MONICA, CALIF.
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LEHIGH UNIV., BETHLEHEM, PA.
On the speed of propagation of waves in a deformed elastic material
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LITTLE [ARTHUR D.] LTD., LONDON [ENGLAND].
Remote printing in Europe via satellite. Volume 1: Summary
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Proceedings of the International Symposium on Marine Pollution Research
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Space station system analysis study. Part 3: Documentation. Volume 2: Technical report
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MONTEVALLO RESEARCH ASSOCIATES, ALA.
MSFC holographic correlation techniques facility study
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MOTOROLA, INC., PHOENIX, ARIZ.
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N

NAGOYA UNIV. [JAPAN].
Parallel-source correspondence in the hypersonic slender body theory
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NATIONAL ACADEMY OF SCIENCES - NATIONAL RESEARCH COUNCIL, WASHINGTON, D. C.
Resource sensing from space: Prospects for developing countries
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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION, WASHINGTON, D. C.
A Mars 1984 mission
[NASA-TM-78419] N77-30140
Proceedings of The Annual Conference of NASA Clinic Directors, Environmental Health Officials, and medical program advisors
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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. GODDARD SPACE FLIGHT CENTER, GREENBELT, MD.
Visible and infrared imaging radiometers for ocean observations
[NASA-TM-X-71374] N77-30447
Land use/land cover mapping [1:25000] of Taiwan, Republic of China by automated multispectral interpretation of LANDSAT imagery
[NASA-TM-X-71382] N77-30577
LANDSAT: US standard catalog, 1-31 May 1977
[NASA-TM-74859] N77-30592
Airborne urban/suburban noise measurements at 121.5/243 MHz
[NASA-TM-X-71372] N77-30644
Magsat: A satellite for measuring near earth magnetic fields
[NASA-TM-X-71370] N77-30683
Simulation of radiation from lightning return strokes: The effects of tortuosity
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[NASA-TM-X-71380] N77-31063
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. LYNDON B. JOHNSON SPACE CENTER, HOUSTON, TEX.
Engineering analysis division internal note. OFT-1 margin assessment
[NASA-TM-74836] N77-30163
Shuttle program: Ground tracking data program document shuttle OFT launch/landing
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The large area corp inventory experiment: An experiment to demonstrate how space-age technology

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The Apollo-Soyuz Test Project: Medical report
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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. JOHN F. KENNEDY SPACE CENTER, COCOA BEACH, FLA.
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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. LANGLEY RESEARCH CENTER, LANGLEY STATION, VA.
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Signature analysis of acoustic emission from graphite/epoxy composites
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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. LEWIS RESEARCH CENTER, CLEVELAND, OHIO.
Cold air performance of a 12.766-centimeter-tip-diameter axial-flow cooled turbine. 2: Effect of air ejection on turbine performance
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Drive train normal modes analysis for the ERDA/NASA 100-kilowatt wind turbine generator
[NASA-TM-73718] N77-30611
Atmospheric ozone measurements made from B-747 AIRLINERS: Spring 1975
[NASA-TM-X-73675] N77-30679
The US Environmental Protection Agency National Pollutant Discharge Elimination System [NPDES]
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[NASA-TM-X-73635] N77-30999

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. MARSHALL SPACE FLIGHT CENTER, HUNTSVILLE, ALA.
Method of preparing zinc orthotitanate pigment
[NASA-CASE-MFS-23345-1] N77-30237
Proceedings of the ASPE/MSFC Symposium on Engineering and Productivity Gains from Space Technology
[NASA-CP-2019] N77-30273
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Space power technology applied to the energy problem
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Concept report: Microprocessor control of electrical power system
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[NASA-CASE-MFS-23175-1] N77-30436
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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. PASADENA OFFICE, CALIF.
Aldehyde-containing urea-absorbing polysaccharides
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Production of crystals from molten solutions
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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. WALLOPS STATION, WALLOPS ISLAND, VA.
Review of health maintenance program findings, 1960-1974
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NATIONAL AEROSPACE LAB., AMSTERDAM [NETHERLANDS].
Aerodynamic data and off-design characteristics of the modified quasi-elliptical airfoil section NLR 7101
[NLR-TR-76012-U] N77-30094
Sound transmission in and radiation from hard-walled annular ducts related to fan engine inlets
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NATIONAL BUREAU OF STANDARDS, BOULDER, COLO.
Liquid helium storage at high density and discharge at high flow rates
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NATIONAL BUREAU OF STANDARDS, WASHINGTON, D. C.
Visual range: Concepts, instrumental determination, and aviation applications
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A second appraisal of methods for estimating self-reaction hazards
[PB-266925/7] N77-30210
Fire research specialists: A directory
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Thermometry in the control of water quality
[PB-267608/8] N77-30661
Dimensions. Volume 61, number 3
[PB-266997/6] N77-31019

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, COLUMBIA, MO.
LACIE: Yield-weather regression models for the Canadian prairies
[NASA-TM-74833] N77-30575
LACIE: Wheat yield models for the United States, revision A
[NASA-TM-74835] N77-30576

NATIONAL PHYSICAL LAB., TEDDINGTON [ENGLAND].
A discussion of the difficulties and errors in the representation of excess Gibbs energy of mixing data by common correlating equations
[NPL-CHEM-56] N77-30202
Correlation of the boiling points of alkanols
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A summary appraisal of engineering ceramics
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[NPL-MOM-23] N77-30298
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The NPL 'MTDATA'-bank and its application to thermodynamic computation on inorganic and metallurgical systems
[NPL-CHEM-70] N77-30788
Some aids for program documentation
[NPL-NAC-76] N77-30822
The thermodynamic properties of benzene and toluene
[NPL-CHEM-52] N77-31001

NATIONAL TRANSPORTATION SAFETY BOARD, WASHINGTON, D. C.
Aircraft accident report. Air Chicago Freight Airlines, Inc., North American TB-25n, n94462, Midway Airport, Chicago, Illinois, August 6, 1976
[NTISUB/C/104-003] N77-30792

NATIONAL WEATHER SERVICE, STERLING, VA.
Survey of anemometers
[AD-A040649] N77-30703

NAVAL AIR DEVELOPMENT CENTER, WARMINSTER, PA.
Effect of hydrogen content on embrittlement and stress corrosion susceptibility of Ti-8Al-1Mo-1V alloy
[AD-A039244] N77-30219

NAVAL AIR ENGINEERING CENTER, LAKEHURST, N.J.
Non-integrated gas turbine engine diagnostics tradeoff analysis
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Mobile Electric Power Plant (MEPP) test set development
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NAVAL AIR PROPULSION TEST CENTER, TRENTON, N.J.
Rotor burst protection program: Experimentation to provide guidelines for the design of turbine rotor burst fragment containment rings
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NAVAL AIR TEST CENTER, PATUXENT RIVER, MD.
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NAVAL CIVIL ENGINEERING LAB., PORT HUENEME, CALIF.
Techniques for transfer immittance measurements
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NAVAL CONSTRUCTION RESEARCH ESTABLISHMENT, DUNFERMLINE (SCOTLAND).
The J integral. A review of theory and a suggested method for J sub c determination
[NCRE/R614] N77-30511
NAVAL ELECTRONICS LAB. CENTER, SAN DIEGO, CALIF.
Navy command control and communications system design principles and concepts. Volume 1: C3 principles and concepts
[AD-A039856] N77-30353
Microcomputers and systems design. Electronic systems can have built-in computational and self test capabilities
[AD-A039227] N77-30778
Fiber optics applications in the shipboard data multiplex system. Developmental fiber optic components could replace coaxial electrical data busses, to immunize the SDMS from effects of shipboard electromagnetic interference
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NAVAL INTELLIGENCE SUPPORT CENTER, WASHINGTON, D. C.
On the nature of the anisotropy of the mechanical properties of hot-rolled titanium alloy plate
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NAVAL OCEAN SYSTEMS CENTER, SAN DIEGO, CALIF.
Further characterization of IRAS doped silicon detectors
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NAVAL POSTGRADUATE SCHOOL, MONTEREY, CALIF.
Statistical analysis of US Navy major aircraft accident rates, pilot and aircraft time-dependent variables
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Optimizing crack: Growth resistance in engineering alloys
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Solrad-11 on-line system [SOLOLS], applications software: Interim system
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Mathematical theory of the fluctuation of acoustic signals in the ocean, part 1, 1976-1977
[AD-A040108] N77-30914
Use of an intrinsic germanium detector array for an aerial survey of surface nuclear radiation
[AD-A038418] N77-30932
Two-dimensional fluid simulation of relativistic electron beam-high Z target interactions
[AD-A040090] N77-30963
Shear stabilization of drift waves in noncircular cross section axisymmetric configurations
[AD-A040748] N77-30964
NAVAL SHIP RESEARCH AND DEVELOPMENT CENTER, BETHESDA, MD.
Seakeeping characteristics of a preliminary design for a sea loiter aircraft
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The enthalpies of distillate fuels by a differential scanning calorimetric method
[AD-A039655] N77-30267
A synthesis of aalc program air cushion vehicle seakeeping data
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Performance prediction method for a wing-in-ground effect vehicle with blowing under the wing
[AD-A039829] N77-30301
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[AD-A039952] N77-30479
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[AD-A039538] N77-30854
NAVAL SURFACE WEAPONS CENTER, WHITE OAK, MD.
Progress toward the Crosstie Memory IV
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NAVAL TRAINING EQUIPMENT CENTER, ORLANDO, FLA.
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NAVAL UNDERWATER SYSTEMS CENTER, NEW LONDON, CONN.
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NEW ENGLAND MEDICAL CENTER HOSPITALS, BOSTON, MASS.
Development of a differential white cell count system: Terminal progress report
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NEW HAMPSHIRE UNIV., DURHAM.
Fulvic acid-metal ion interactions in water
[PB-267597/3] N77-30211
A determination of convective electric fields through in situ measurements of the ionospheric F-region thermal ion spectra
N77-30673
Solar energetic particle propagation from 1 to 5 AU
N77-31061
NEW JERSEY INST. OF TECHNOLOGY, NEWARK.
A fast boundary tracking algorithm for constrained nonlinear mathematical programming problems
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NEW MEXICO UNIV., ALBUQUERQUE.
Development of high pressure liquid chromatographic techniques
[AD-A039644] N77-30196
NEW YORK UNIV., N. Y.
The artificial compression method for computation of shocks and contact discontinuities. 3: Self-adjusting hybrid schemes
[AD-A040141] N77-30427
Evaluation of automated natural language processing in the further development of science information retrieval
[PB-266948/9] N77-31020
NORTH CAROLINA STATE UNIV., RALEIGH.
The erosion and thermal shock resistance of hot pressed tantalum carbide containing free carbon and refractory fibers
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Properties of fibrous morphologies of poly(ethylene terephthalate) prepared by high-pressure extrusion in a capillary die
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Creep-rupture data analysis: Engineering application of regression techniques
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A theoretical study of heterojunction and graded band gap type solar cells
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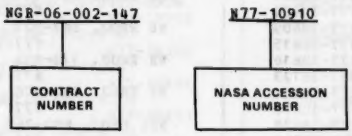

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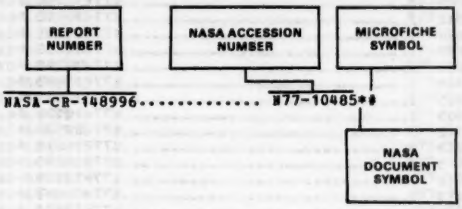

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NASA-CR-151454 ..... N77-30548*#
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NASA-CR-151501 ..... N77-30154*#
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NASA-CR-151503 ..... N77-30151*#
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NASA-CR-152584 ..... N77-30370*#
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NASA-CR-153401 ..... N77-30608*#
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NASA-CR-153409 ..... N77-30604*#
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NASA-CR-153891 ..... N77-30693*#
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NASA-CR-153986 ..... N77-30643*#
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NASA-CR-154268 ..... N77-30562*#
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NASA-CR-154286 ..... N77-31004*#
NASA-CR-154287 ..... N77-30084*#
NASA-CR-154288 ..... N77-30408*#
NASA-CR-154648 ..... N77-30409*#
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NASA-CR-154807 ..... N77-30750*#
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NASA-CR-154809 ..... N77-30181*#
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NASA-CR-154843 ..... N77-30456*#
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NASA-CR-154845 ..... N77-30445*#
NASA-CR-154846 ..... N77-31040*#
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NASA-CR-154872 ..... N77-30416*#

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NASA-SP-411 ..... N77-30735*#
NASA-SP-8093 ..... N77-30171*#

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NASA-TM-X-71367 ..... N77-30272*#
NASA-TM-X-71368 ..... N77-30704*#
NASA-TM-X-71369 ..... N77-30682*#
NASA-TM-X-71370 ..... N77-30683*#
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NASA-TM-X-71372 ..... N77-30644*#
NASA-TM-X-71374 ..... N77-30447*#
NASA-TM-X-71375 ..... N77-31057*#
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NASA-TM-X-71380 ..... N77-31063*#
NASA-TM-X-71381 ..... N77-30687*#
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NASA-TM-74052 ..... N77-30747*#
NASA-TM-74054 ..... N77-30315*#
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NASA-TM-74062 ..... N77-30921*#
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NASA-TM-74836 ..... N77-30163*#
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NASA-TM-75133 ..... N77-30173*#
NASA-TM-75134 ..... N77-30680*#
NASA-TM-78419 ..... N77-30140*#
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NASA-TN-D-8439 ..... N77-30710*#
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NATC-TM-77-1-RW ..... N77-30108 #

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NBS-DIM-61-3 ..... N77-31019 #

NBS-GCR-77-85 ..... N77-30743 #

NBS-MONO-159 ..... N77-30102 #

NBSIR-76-850 ..... N77-30303 #
NBSIR-76-1149 ..... N77-30210 #
NBSIR-77-1227 ..... N77-30661 #
NBSIR-77-1264 ..... N77-30271*#

NCHSR-77/167 ..... N77-30744 #

NCRE/R614 ..... N77-30511 #

NCSR-R-10 ..... N77-30748 #

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NCTRP-TR-126 ..... N77-30755 #

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NLR-TR-75144-U ..... N77-30913 #
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NPL-MOM-23 ..... N77-30298 #

NPL-NAC-74 ..... N77-30381 #
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NPS-55-77-4 ..... N77-30898 #
NPS-55-77-5 ..... N77-30355 #
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NRL-MR-3452 ..... N77-30932 #
NRL-MR-3456 ..... N77-30232 #
NRL-MR-3461 ..... N77-30469 #
NRL-MR-3466 ..... N77-30812 #
NRL-MR-3476 ..... N77-30914 #
NRL-MR-3482 ..... N77-30464 #
NRL-MR-3486 ..... N77-30460 #
NRL-MR-3490 ..... N77-30124 #
NRL-MR-3494 ..... N77-30378 #
NRL-MR-3496 ..... N77-30963 #
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NRL-8085 ..... N77-30512 #
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NSF/RA/M-75-294 ..... N77-30635 #
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NSF/RANN/AER72-03478-A04/FR-76 ..... N77-30614 #
NSF/RANN/SE/ERT-74-19063/FR-75 ..... N77-30635 #

NSWC/WOL/TR-77-21 ..... N77-30783 #

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NTISUB/C/138-005 ..... N77-30592*#

NTSB-AAR-77-3 ..... N77-30792 #

NUREG-0031 ..... N77-30692 #
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NUSC-TR-5495 ..... N77-30855 #
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NWC-TP-5883 ..... N77-30114 #
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OWRT-B-080-IND(4) ..... N77-30593 #
OWRT-B-080-IND(5) ..... N77-30795 #
OWRT-B-080-IND(7) ..... N77-30794 #

PAPER-247 ..... N77-30646 #
PAPER-570 ..... N77-30593 #
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PATR-0211-01 ..... N77-30260 #

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PB-264171/0 ..... N77-30590 #
PB-265264/2 ..... N77-30646 #
PB-266663/4 ..... N77-30586 #
PB-266703/8 ..... N77-31039 #
PB-266724/4 ..... N77-30657 #
PB-266739/2 ..... N77-30653 #
PB-266743/4 ..... N77-30648 #
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PB-266753/3 ..... N77-30693*#
PB-266756/6 ..... N77-30651 #
PB-266769/9 ..... N77-30589 #
PB-266771/5 ..... N77-30588 #
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PB-266785/5 ..... N77-31036 #
PB-266797/0 ..... N77-30655 #
PB-266827/5 ..... N77-30656 #
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PB-266854/9 ..... N77-30255 #
PB-266872/1 ..... N77-31003 #
PB-266874/7 ..... N77-30650 #
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PB-266933/1 ..... N77-30302 #
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PB-266945/5 ..... N77-30303 #
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PB-266948/9 ..... N77-31020 #
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PB-266961/2 ..... N77-31040*#
PB-266963/8 ..... N77-30484 #
PB-266987/7 ..... N77-31031 #
PB-266992/7 ..... N77-30584 #
PB-266993/5 ..... N77-31018 #
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PB-267075/0 ..... N77-30899 #
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PB-267089/1 ..... N77-30793 #
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PB-267133/7 ..... N77-30746 #
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PB-267283/0 ..... N77-30660 #
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PB-267297/0 ..... N77-30257 #
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PB-267428/1 ..... N77-31041 #
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PB-267472/9 ..... N77-30794 #
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PB-267531/2 ..... N77-30708 #
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PB-267563/5 ..... N77-30695 #
PB-267571/8 ..... N77-30664 #
PB-267597/3 ..... N77-30211 #
PB-267601/3 ..... N77-30667 #
PB-267608/8 ..... N77-30661 #
PB-267629/4 ..... N77-31046 #
PB-267630/2 ..... N77-30665 #
PB-267633/6 ..... N77-30269 #
PB-267634/4 ..... N77-30666 #
PB-267660/9 ..... N77-30434 #
PB-267723/5 ..... N77-30587 #
PB-268364/7 ..... N77-30744 #
PB-268480/1 ..... N77-30360 #

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QR-1 ..... N77-30374 #
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QR-2 ..... N77-30604*#
QR-2 ..... N77-30605*#
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R-77-159 ..... N77-30170*#
R-1829-PR ..... N77-30261 #
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RADC-TR-77-19 ..... N77-30321 #
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RARDE-TR-11/76 ..... N77-30201 #

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REPT-2-57000/5R-3239 ..... N77-30107*#
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SAMSO-TR-77-45 ..... N77-30197 #
SAMSO-TR-77-73 ..... N77-30209 #
SAMSO-TR-77-75 ..... N77-30347 #
SAMSO-TR-77-79 ..... N77-30149 #
SAMSO-TR-77-91 ..... N77-30184 #
SAMSO-TR-77-96 ..... N77-30200 #

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SAO-SR-378 ..... N77-30686*#

SCRC-CR-76-1 ..... N77-30328 #
SCRC-CR-76-65 ..... N77-30950 #

SER-50991 ..... N77-30090*#

SM-ALC/ACD-76-01 ..... N77-30776 #

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SX/111/2Q ..... N77-30604*#

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TM-77-62 ..... N77-30417 #
TM-77-187 ..... N77-30093 #

TN-77-2 ..... N77-30574*#
TN-1977-11 ..... N77-30327 #

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TR-1 ..... N77-30208 #
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